LIBRARIES
UNIVERSITY OF WISCONSIN–MADISON

Minerals yearbook 1950. Year 1950 1953

Bureau of Mines
Washington, D. C.: Bureau of Mines : United States Government Printing Office, 1953

https://digital.library.wisc.edu/1711.dl/PPYAWXJZXOESO8L

http://rightsstatements.org/vocab/NoC-US/1.0/

As a work of the United States government, this material is in the public domain.

For information on re-use see:
http://digital.library.wisc.edu/1711.dl/Copyright

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

82d Congress, 2d Session - - - - - - - House Document No. 294

MINERALS YEARBOOK

1950

Prepared by the staff of the

BUREAU OF MINES

LEONARD L. FISCHMAN, *Editor*

Assisted by:

JOHN HOZIK

ROBERT E. HERMAN

UNITED STATES DEPARTMENT OF THE INTERIOR

OSCAR L. CHAPMAN, *Secretary*

BUREAU OF MINES

JOHN J. FORBES, *Director*
THOMAS H. MILLER, *Assistant Director for Operations*
W. C. SCHROEDER, *Assistant Director for Programming*

OFFICE OF THE DIRECTOR:

ARNO C. FIELDNER, *Chief Fuels Technologist*
E. D. GARDNER, *Chief Mining Engineer*
O. C. RALSTON, *Chief Metallurgist*
SAM H. SCHURR, *Chief Economist*
DONALD G. WELSH, *Chief Counsel*
ALLAN SHERMAN, *Chief, Office of Minerals Reports*
H. J. SLOMAN, *Assistant to the Director*
J. H. HEDGES, *Special Assistant to the Director*

DIVISIONS:

LOUIS C. McCABE, *Chief, Fuels and Explosives Division*
JAMES WESTFIELD, *Chief, Health and Safety Division*
PAUL ZINNER, *Chief, Minerals Division*
W. E. RICE, *Chief, Administrative Division*

REGIONAL OFFICES:

SINCLAIR H. LORAIN, *Regional Director, Region I (Juneau, Alaska)*
STEPHEN M. SHELTON, *Regional Director, Region II (Albany, Oreg.)*
HAROLD C. MILLER, *Regional Director, Region III (San Francisco, Calif.)*
JOHN H. EAST, JR., *Regional Director, Region IV (Denver, Colo.)*
P. T. ALLSMAN, *Regional Director, Region V (Minneapolis, Minn.)*
CLIFFORD W. SEIBEL, *Regional Director, Region VI (Amarillo, Tex.)*
HEWITT WILSON, *Regional Director, Region VII (Norris, Tenn.)*
HAROLD P. GREENWALD, *Regional Director, Region VIII (Pittsburgh, Pa.)*
ELMER W. PEHRSON, *Regional Director, Region IX (Washington, D. C.)*

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1953

MNK
1950

FOREWORD

I am pleased to present this 1950 Minerals Yearbook. Its production was hindered to a large extent by the priority which the staff of the Bureau necessarily accorded the urgent problems associated with the defense mobilization. Despite these emergency burdens, however, I am confident that the usual high quality of the Yearbook has been maintained. Although the Bureau's work on mobilization planning, development of new mineral resources, synthetic-liquid-fuel production, mine safety, and the like may command more day-by-day attention, I believe (and in this I am reinforced by the comments of users in industry and elsewhere) that this less dramatic function— to provide year in and year out the basic data on minerals necessary for wise industrial planning and sound Government policy—is no less appreciated. Our efforts shall always be bent toward adapting these data to changing needs and conditions and toward improving their usefulness.

J. J. Forbes, *Director*.

PREFACE

In this edition of the MINERALS YEARBOOK, a continued effort has been made to improve both the quality of the information reported and its manner of presentation, to make it increasingly valuable both to those in industry who must plan pricing, marketing, expansion, and other policy matters and to those in Government who establish policies bearing on the Nation's welfare and security. It is hoped that users of the statistics and other data in these volumes will help the process of improvement and adaptation by making their needs known to us.

Questionnaires answered by mineral producers and users are the source of most of the information herein. Other sources are the business press, trade associations, scientific journals, international organizations, and Government agencies. In particular, data on foreign trade are obtained from the United States Department of Commerce and data on foreign production and developments largely through the United States Foreign Service.

During the course of publication, a few errors and inconsistencies were detected in the preprint chapters. These have been corrected in this volume, and for the benefit of those who previously obtained separate chapter preprints, an errata sheet is available.

Cooperating with the Bureau of Mines in the conduct of statistical canvasses in their respective States were the following State officials, to whom grateful acknowledgment is made:

Alabama: Walter B. Jones, State geologist, Geological Survey of Alabama, University.
Alaska: Leo Saarela, commissioner of mines, Department of Mines, Juneau.
California: Olaf P. Jenkins, chief, Division of Mines, and State mineralogist, Department of Natural Resources, San Francisco.
Florida: Herman Gunter, director, Florida Geological Survey, Tallahassee.
Georgia: Garland Peyton, director, Department of Mines, Mining and Geology, Atlanta.
Illinois: M. M. Leighton, chief, Illinois State Geological Survey, Urbana.
Iowa: H. Garland Hershey, district and State geologist, Iowa Geological Survey, Iowa City.
Kansas: John C. Frye, executive director, and R. C. Moore, State geologist and director of research, State Geological Survey of Kansas, Lawrence.
Kentucky: Arthur C. McFarlan, director, and Daniel J. Jones, State geologist, Kentucky Geological Survey, University of Kentucky, Lexington.
Maryland: Joseph T. Singewald, Jr., director, Department of Geology, Mines, and Water Resources, Baltimore.
Michigan: Frank Pardee, State geologist and division chief, Geological Survey Division, Department of Conservation, Lansing.
Missouri: Edward L. Clark, director and State geologist, Department of Business and Administration, Division of Geological Survey and Water Resources, Rolla.
New Hampshire: T. R. Meyers, State geologist, Mineral Resources Committee, New Hampshire State Planning and Development Commission, Durham.
New Jersey: Meredith E. Johnson, State geologist, Bureau of Geology and Topography, Department of Conservation and Economic Development, Trenton.
New York: John G. Broughton, State geologist, New York State Science Service, Office of Geology, Albany.

North Carolina: Jasper L. Stuckey, State geologist, Department of Conservation and Development, Division of Mineral Resources, Raleigh.
Oklahoma: Robert H. Dott, director, Oklahoma Geological Survey, Norman.
South Dakota: E. P. Rothrock, State geologist, South Dakota State Geological Survey, Vermillion.
Texas: John T. Lonsdale, director, Bureau of Economic Geology, University of Texas, Austin.
Utah: Arthur L. Crawford, director, Utah Geological and Mineralogical Survey, University of Utah, Salt Lake City.
Virginia: William M. McGill, State geologist, Department of Conservation and Development, Geological Survey Division, Charlottesville.
Washington: Sheldon L. Glover, supervisor, Division of Mines and Geology, Olympia.
West Virginia: Paul H. Price, State geologist, West Virginia Geological and Economic Survey, Morgantown.
Wisconsin: E. F. Bean, State geologist, Wisconsin Geological and Natural History Survey, University of Wisconsin, Madison.

Besides the work of my immediate assistant, John Hozik, and Robert E. Herman, who succeeded him during the course of the year, I am greatly indebted to the rest of the YEARBOOK staff for their assistance in checking manuscripts, editing, and expediting the flow of manuscripts. These included K. Joyce D'Amico, Blanche G. Robertson, Ethel M. Tucker, and Anna P. Lake. Credit is also due Adelaide B. Palmer, not only for drafting many of the charts for the YEARBOOK but for seeing that the many additional graphs prepared at the Bureau's Pittsburgh office under the supervision of Louis F. Perry were completed in good order.

All but one of the world-production tables were prepared under direct supervision of Berenice B. Mitchell, of the Foreign Minerals Region. Other Bureau of Mines statisticians and researchers who gave substantial assistance to the authors of chapters were: In Washington, D. C.—Hope R. Anderson, Elizabeth K. Elsner, Nina L. Jones, Naomi W. Kearney, James G. Kirby, Lena M. Lunsford, Ann C. Mahoney, Annie L. Marks, Zena M. Mohme, Robert C. Morris, Elizabeth J. Reid, Dora D. Springer, Mary E. Trought, and Virginia E. Wrenn. In Juneau, Alaska—Opal Y. Sharman. In San Francisco, Calif.—Leona Froehlich. In Denver, Colo.—Stella K. Drake and Katherine I. Mitten. In Minneapolis, Minn.—Luella Niemeyer. In Albany, Oreg.—O. William Esch, Catherine Moll, and John Ulman. In Pittsburgh, Pa.—Roy H. Davis.

I wish to acknowledge, finally, the work of my predecessor, Allan F. Matthews, who before his resignation from the Bureau early in 1951, did the advance planning for this edition and edited several chapters.

LEONARD L. FISCHMAN.

OCTOBER 1952.

CONTENTS

PART I. GENERAL REVIEWS

Review of the Mineral Industries in 1950

By Paul W. McGann and Leonard L. Fischman

GENERAL SUMMARY

THE MINERAL INDUSTRIES had a near-record year in 1950, as rising industrial activity in general, greatly accentuated by the outbreak of hostilities in Korea in midyear, called forth increasing supplies of mineral fuels and raw materials. The aggregate value of mineral production was second only to that in 1948, and the aggregate physical volume was exceeded only in 1948 and 1947. Lower coal production accounted for the failure to surpass these earlier years.

Growth of production was fairly constant throughout the year, especially for crude petroleum; its physical output for the year as a whole exceeded that of 1949 by 7 percent. According to Federal Reserve Board indexes, other relative gains were 16 percent for coal, 9 percent for fuels in general, and 17 percent for metals. The increase for mining in general was of the order of 10 percent. This was not quite as large as the general increase in industrial production but clearly reflected the total-industrial trend (*see* fig. 1).

Consumption of certain metals increased sharply in 1950—notably arsenic, cobalt, the platinum-group metals, magnesium, and tin. Virtually all minerals, however, showed some increase in consumption. Petroleum consumption set a new record, as did consumption of iron ore. Consumption of coal increased slightly over 1949 but continued to be relatively low.

Although Bureau of Mines and Bureau of Labor Statistics data on employment in the mineral industries differ in nature, both series indicate a decline in average employment in the mineral industries as a whole between 1949 and 1950. As unemployment also declined, a net loss of workers was indicated. The increased production in 1950 was apparently accomplished largely by operating establishments a greater number of shifts during the year, the average workday remaining virtually unchanged.

Average hourly earnings generally increased, and there were more substantial rises in mineral manufacturing than in mining as such. With the minor exception of anthracite mining, where productivity declined, labor productivity in the crude-mineral sector generally increased and surpassed the previous peak (1947) by a significant margin.

The safety record of the mineral industries in 1950 was relatively good. Although both fatal and nonfatal injuries increased over 1949, the fatality rate per million man-hours of exposure was the second lowest on record and the nonfatal-injury rate the lowest. Absence of any major disasters (five or more fatalities) during the year facilitated this favorable showing.

Annual average prices of mineral products in 1950 were generally little changed from those in 1949, although there was an upward trend within the year for most categories. Metals in particular ended the year substantially higher than they started; but, except for iron ore, which underwent two big jumps, part of the increase was a recovery from decreases during 1949.

The increased sales of mineral products in 1950 resulted in larger mining corporate income before taxes. Mineral-manufacturing corporations, however, fared considerably better than mining corporations. Income after taxes also increased for both groups, but not to the same degree.

The income of unincorporated mineral-industry enterprises also increased, particularly that of oil-well operators, who gained a larger increase during the year, both absolute and relative, than their incorporated counterparts.

Plant and equipment expenditures for the year as a whole were lower than in 1949 for most mineral industries, but there was an uptrend as the year progressed. The bulk of the expenditure was on crude-petroleum production.

Foreign trade in minerals in 1950 advanced over 1949; but, owing to the heavier domestic demand for raw materials, most of the increased activity was in imports, particularly imports of steel, which rose sharply. As regards nonferrous metals, there was a shift from the importation of ores and concentrates to that of more processed forms.

Rates of duty on a number of mineral commodities were reduced as a result of the trade-agreement negotiations at Annecy. On the other hand, levies on a number of other products were increased at the year end as a result of termination of the 1943 trade agreement with Mexico and of withdrawal of China from the General Agreement on Tariffs and Trade. The import tax on copper came back in force July 1, when the previous suspension was allowed to lapse, but the general duty suspension on metal scrap was reinstated October 1.

The mineral industries continued to lead private investment abroad in 1950, both in terms of new investment and in terms of the outstanding total. About two-fifths of American direct investment abroad at the end of 1950 was in the mineral industries, and three-quarters of this, in turn, was in petroleum. There was a decided shift in new investment in 1950 from Latin America to Canada.

Principal trends in mining-industry technology in 1950 included the increased use of aerial geophysical prospecting and further development of the continuous miner. Use of roof bolting, of trackless mining, and of Diesel power continued to spread. Research on beneficiating taconite was spurred by the increasing demand for iron ore; new methods for beneficiating nonferrous ores also received serious attention. Outstanding in the field of fuel technology was the work of the Bureau of Mines on synthetic liquid fuels; considerable work was also done on coking coals.

World mineral production followed a similar course in 1950 to that in the United States. Production was generally higher than in 1949, and a number of records were set, petroleum, natural gas, and iron ore being among the principal minerals to reach new production peaks.

Anxiety over prospective surpluses early in 1950 led to tentative steps to reach an international commodity agreement on tin, but a conference for this purpose in October adjourned without any definitive results. Meanwhile, the mounting concern over shortages after the outbreak of hostilities in Korea produced various intergovernmental discussions, including conversations on possible raw-materials allocation among the United States, Canada, the United Kingdom, and France.

PRODUCTION

Value of Production.—Increases both in physical output and unit values pushed the value of mineral production in 1950 above that of 1949 in all major categories. Value of fuel production was up about 10 percent, of other nonmetallic minerals 16 percent, and of metallic minerals 23 percent. Total value, calculated on the revised basis,[1] was a little short of $12 billion, or about half a billion less than 1948, the only higher year.

The value of mineral production for 1946–50 is summarized in table 1. Detailed data will be found in the Statistical Summary chapter of this volume.

Table 1.—Value of mineral production in the United States, 1946–50

[Millions of dollars]

Year	Nonmetallic			Metallic	Grand total
	Fuels	Other	Total		
1946	5,084	1,249	6,333	729	7,062
1947	7,181	1,345	8,526	1,084	9,610
1948	9,495	1,559	11,054	1,219	12,273
1949	7,912	1,567	9,479	1,101	10,580
1950	8,681	1,823	10,504	1,351	11,855

Volume of Production.—The Federal Reserve Board index of physical volume of mineral production averaged 148 for the year (1935–39=100). It increased at an average rate of about 2 percent per month, somewhat less than the rate of increase of durable manufactured goods. The initial rise was partly a recovery from the trough of 1949, and the continued growth after midyear was due in large part to the hostilities in Korea.

The statistics of growth are smoothest for crude petroleum. The seasonally adjusted metal-mining index dropped significantly in April and at the year end, owing largely to the fact that weather conditions did not fit the average seasonal pattern for iron ore used in calculating the seasonal adjustment. Growth in the coal-production index was interrupted more seriously during the year—a reflection of the fluctuations in labor-management relations, especially the work stoppages in February.

There is no FRB monthly index of production for nonfuel, nonmetallic minerals. A rough volume index, obtained by multiplying

[1] For description of the revision, see Minerals Yearbook 1949, pp. 29–30.

Bureau of Labor Statistics production employment by weekly hours for nonmetallic minerals, shows a monthly growth trend similar to that for the aggregate of all minerals.

Annual physical production data for the mining sector in 1950, according to the best available data in each case, show the following increases over 1949: All mining, 10 percent; metallic minerals, 17 percent; nonmetallic, 6 percent; bituminous coal, 18 percent; anthracite, 3 percent; crude petroleum, 7 percent; and natural gas, 16 percent. The 1950 outputs of coal (both bituminous and anthracite), petroleum, and iron ore were below 1948, but outputs of nonferrous metals, nonmetallic minerals, and natural gas were above 1948.

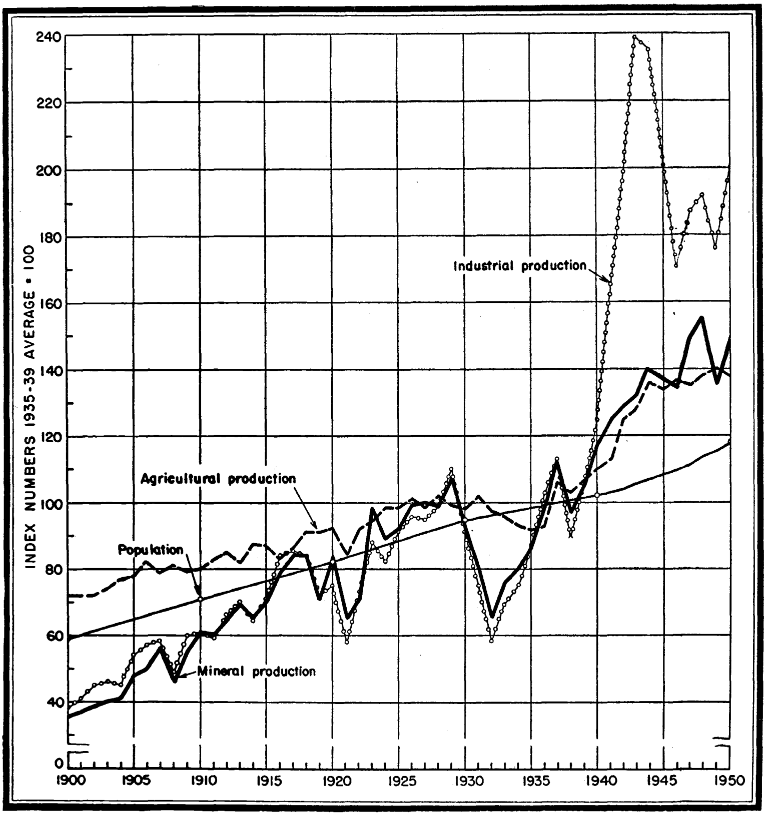

FIGURE 1.—Physical volume of mineral production compared with industrial production (manufactures and minerals), agricultural production, and population, 1900–50. Sources: Federal Reserve Board, U. S. Department of Agriculture, and Bureau of the Census.

Relation to National Income.—The 1950 figure for national income originating in mining industries was 10 percent greater than in 1949 and equaled the increase for all industries. The increase for mineral-manufacturing industries was over twice as great, owing largely to a 33-percent increase for the iron and steel industry. Although national income originating in the mining industry was less than in 1948, that for mineral manufacturing was the highest in history, even after adjustment for price changes.

In both mining and mineral manufacturing, most of the increase in income ended as net corporate income before taxes rather than as wage and related payments. This was true to a lesser extent for the rest of the economy in 1950. However, half of the increased corporate profit before taxes for the aggregate of all industries was due to increased inventory values, but only one-third of the increase in mining profit before taxes and less than one-tenth of that of the iron and steel industry resulted from this.[2]

Number and Size of Firms.—A slight additional decrease brought the number of mining firms down to 34,100 (end of year) compared with the postwar high of 35,800 in the fall of 1948.[3] These changes in number of firms affect mostly the 85 percent having less than 20 employees each and employing in total less than 13 percent of all mining-industry employees.[4] This net rate of business-population change is the difference between the gross rates of new firms entering and leaving, which are about five times greater. The gross, like the net, rates of change are much smaller for the larger firms.

CONSUMPTION AND STOCKS

Domestic Consumption.—Consumption of various minerals in the United States in 1950 almost without exception increased over that in 1949. Some of the larger increases took place among the metals, with consumption of cobalt, magnesium, platinum-group metals, and tin (primary) all increasing by 50 percent or more. Consumption of arsenic more than doubled, but there had been a pronounced drop in 1949, and the net increase over 1948 was only about one-third.

Other large increases (one-third or more) were reported in the consumption of antimony (primary), asbestos, chromium, copper, mica, nickel, talc, and slab zinc. Consumption of coal was virtually unchanged from 1949 and was well below both 1948 and the World War II peak. Consumption of iron ore, in keeping with increased steel output, was up about one-fifth to set a new record. Petroleum consumption, although up less than 10 percent, also set a new mark.

Sources of United States Consumption.—Tables 2 and 3 show the apparent consumption of principal minerals in the United States in 1950 and the sources from which that consumption was satisfied. Of the 27 minerals covered, requirements for more than one-fourth, including coal, salt, clays, phosphate rock, boron, and bromine, were satisfied in 1950 out of current mine production. Requirements for two other minerals whose domestic production is normally more than adequate—molybdenum and sulfur—were satisfied partly out of current domestic production and partly out of accumulated stocks. Thus, for fully one-third of the principal minerals, the United States was completely self-sufficient.

---

[2] U. S. Department of Commerce, Office of Business Economics, National Income, 1951 Edition: Survey of Current Business Suppl., 1951, pp. 159–179.

[3] Survey of Current Business, The Business Population: Vol. 32, No. 6, June 1952, p. 14.

[4] Foss, Murray F., and Churchill, Betty C., The Size Distribution of the Postwar Business Population: Survey of Current Business, vol. 30, No. 5, May 1950, pp. 12–20.

TABLE 2.—New supply and apparent consumption of principal minerals in the United States, 1950[1]

Mineral and unit of measurement	Domestic production			Net imports[4]	Total new supply	Net decrease in stocks[5]	Apparent consumption
	Primary[2]	Secondary[3]	Total				
Antimony ... short tons (Sb content)	[6] 2,497	18,771	21,268	16,365	37,633	−2,116	35,517
Bauxite, crude ... thousand long tons (dried equivalent)	1,335	----------	1,335	2,466	3,801	459	4,260
Boron minerals and compounds[7] ... thousand short tons (gross weight)	648	----------	648	−143	505	----------	505
Bromine and bromine in compounds ... thousand pounds	98,502	----------	98,502	−763	97,739	----------	97,739
Cadmium ... thousand pounds (Cd content)	[8] 9,190	----------	9,190	277	9,467	[9] 35	9,502
Chromite ... thousand short tons	([10])	----------	([10])	1,302	1,302	151	1,453
Clays ... do	39,381	----------	39,381	−77	39,304	----------	39,304
Coal:							
Anthracite ... do	44,077	----------	44,077	−3,874	40,203	−293	39,910
Bituminous and lignite ... do	[11] 515,899	----------	515,899	−25,121	490,778	−30,350	460,428
Cobalt ... thousand pounds (Co content)	[6] 809	126	935	9,339	10,274	1,639	11,913
Copper ... thousand short tons (Cu content)	[12] 921	485	1,406	387	1,793	429	2,222
Fluorspar, finished ... short tons	301,510	----------	301,510	163,894	465,404	−31,433	433,971
Gypsum, crude ... thousand short tons	8,193	----------	8,193	3,167	11,360	----------	11,360
Iron ore[13] ... thousand gross (long) tons	98,045	----------	98,045	5,682	103,727	−392	103,335
Lead ... thousand short tons (Pb content)	[12] 419	428	847	529	1,376	64	1,440
Magnesium ... short tons (Mg content)	15,726	4,970	20,696	283	20,979	5,314	26,293
Manganese[14] ... thousand short tons (Mn content)	[6] 187	----------	187	982	1,169	36	1,205
Molybdenum ... thousand pounds (Mo content)	28,480	----------	28,480	−6,232	22,248	15,069	37,317
Nickel ... short tons (Ni content)	[15] 913	4,781	5,694	85,950	91,644	1,523	93,167
Petroleum, crude ... million barrels	[11] 1,974	----------	1,974	138	2,112	5	2,117
Phosphate rock ... thousand long tons (gross weight)	11,114	----------	11,114	−1,745	9,369	−860	8,509
Potash[16] ... thousand short tons (K_2O equivalent)	1,287	----------	1,287	134	1,421	−11	1,410
Salt, common ... thousand short tons	16,616	----------	16,616	−182	16,434	----------	16,434
Sulfur ... thousand long tons (S content)	[17] 5,984	----------	5,984	−1,479	4,505	444	4,949
Tin ... long tons (Sn content)	15	24,183	24,198	[18] 108,876	133,074	−3,191	129,883
Tungsten ore and concentrates[19] ... short tons (gross weight)	4,166	----------	4,166	[20] 16,979	21,145	−295	20,850
Zinc ... thousand short tons (Zn content)	[12] 588	74	662	380	1,042	107	1,149

[1] This table aims to show new supply and apparent consumption for each mineral in 1950 at the point where it ceases to be "extracted" or "recovered" and enters into specialized uses. This means, essentially, that all sources of the minerals, including imports in any form, are included as part of the supply, whereas exports of manufactured and semimanufactured items containing the mineral are excluded. Statistical exigencies, particularly in connection with arriving at the breakdown of sources of apparent consumption shown in table 3, necessitate various degrees of deviation from strict point-of-consumption measurement, but the main effect of such deviation is to attribute to consumption in 1950 quantities which, depending upon changes in stocks in various parts of the industrial pipeline, may actually have been consumed in an earlier or later year. The reason for including manufactured imports containing the mineral in question is that such imports substitute for domestic production which would otherwise have been needed for the equivalent end products.

"New supply" includes, in addition to net imports, both domestic primary production and recovery from "old" scrap. The latter is material that has already been in actual use in the form of end products, usually over a period of years. "New" or "process" scrap is considered, for purposes of this table, not as an element in supply and consumption, but as part of the industrial stocks of "goods in process"; no attempt is made to measure the magnitude of changes therein. Circulating "process" scrap is actually important only in the case of fabrication of metals, where it is important to distinguish between "new" and "total" (sometimes called "ingot-equivalent") supply. The practical effect of confining the data to new supply, as is done herein, is that the consumption figure is net of that portion of the metallic flow which is not actually included in end products, but becomes scrap at some point in the fabrication process and is "circulated" back through the industrial system for reprocessing.

The foregoing definition is chosen as the best measure of consumption that can be applied across-the-board to all mineral commodities. The resulting supply and consumption figures may not agree with those shown in the individual chapters of this volume, since the latter are more specifically oriented toward the particular statistical usages which prevail for each of the individual minerals.

Generally speaking, the data in this table apply to continental United States only. However, lack of differentiated data in certain instances—notably for imports and exports—introduces a certain amount of unavoidable error with respect to geographical coverage.

[2] Includes all material, not previously "consumed," that is ultimately of domestic origin—that is, has been extracted from the earth of the United States. The aim, however, is to measure quantities consumed during a given time period, and the actual extraction may have taken place in an earlier period. The figure includes any "secondary" recovery (from tailings, flue dust, slags, etc.) before the point of consumption.

To take fuller account of stock changes, actual production, rather than data on shipments, are shown in this table where available. The "production" figure may therefore differ from that shown in table 2 of the Statistical Summary chapter of this volume, where "shipments" are generally used to have a more accurate valuation.

[3] From "old" scrap only. Does not include either recovery from process scrap or secondary recovery before the point of consumption. (*See* footnotes 1 and 2.)

[4] Minus sign denotes net exports. Imports include all sources of the mineral, including finished products, for which it is possible to calculate the mineral content. Exports include only those shipments occurring prior to the point of consumption. (*See* footnote 1.)

[5] Minus sign denotes increase. Changes in National Stockpile are not taken into account.

[6] Recoverable metal content of mine output.

[7] Borax, anhydrous sodium tetraborate, kernite, boric acid, and colemanite.

[8] Metallic cadmium and cadmium content of compounds (excluding compounds made from metal).

[9] Includes stocks of metal producers (primary), compound manufacturers, and distributors for metallic cadmium.

[10] Less than 500 tons.

[11] Final figure.

[12] Primary refinery production from domestic ores.

[13] Usable ore (exclusive of ore containing 5 percent or more manganese).

[14] Includes manganese consumed in form of ferromanganese and all types of manganese-bearing ores.

[15] Recovered in copper refining; a portion, not separable, is actually recovered from imported blister copper.

[16] Potash (K_2O) equivalent of marketable potassium salts.

[17] Includes all forms of production—native and recovered elemental sulfur, and sulfur content of pyrites and byproduct sulfuric acid and other compounds.

[18] Includes 79 tons produced in Alaska in 1950 and assumed to be imported into continental United States.

[19] 60 percent WO_3 basis.

[20] Includes 13 tons shipped from mines in Alaska in 1950 and assumed to be imported into continental United States.

TABLE 3.—Percentage distribution by sources of supply of principal minerals consumed in the United States, 1950

Mineral and unit of measurement	Apparent consumption[1]	Percent from— Domestic production: Primary	Domestic production: Secondary[4]	Domestic production: Total	Net imports[2]: Canada and Mexico	Net imports[2]: Other Western Hemisphere	Net imports[2]: Other "free world"[5]	Net imports[2]: U.S.S.R. bloc	Net imports[2]: Total	Net decrease in stocks[3]
Antimony — short tons (Sb content)	35,517	6.6	49.9	56.5	16.7	17.0	9.4	0.4	43.5	------
Bauxite, crude — thousand long tons (dried equivalent)	4,260	31.3	------	31.3	------	47.5	10.4	------	57.9	10.8
Boron minerals and compounds — thousand short tons (gross weight)	505	100.0	------	100.0	------	------	------	------	------	------
Bromine and bromine in compounds — thousand pounds	97,739	100.0	------	100.0	------	------	------	------	------	------
Cadmium — thousand pounds (Cd content)	9,502	96.7	------	96.7	2.4	(6)	0.5	------	2.9	0.4
Chromite — thousand short tons	1,453	(6)	------	(6)	------	7.4	77.3	4.9	89.6	10.4
Clays — do	39,304	100.0	------	100.0	------	------	------	------	------	------
Coal:										
Anthracite — do	39,910	100.0	------	100.0	------	------	------	------	------	------
Bituminous and lignite — do	460,428	100.0	------	100.0	------	------	------	------	------	------
Cobalt — thousand pounds (Co content)	11,913	6.8	1.0	7.8	------	------	78.4	------	78.4	13.8
Copper — thousand short tons (Cu content)	2,222	41.5	21.8	63.3	4.6	12.8	------	------	17.4	19.3
Fluorspar, finished — short tons	433,971	64.8	------	64.8	18.6	------	16.6	------	35.2	------
Gypsum, crude — thousand short tons	11,360	72.1	------	72.1	27.9	------	------	------	27.9	------
Iron ore — thousand gross (long) tons	103,335	94.5	------	94.5	------	2.9	2.6	------	5.5	------
Lead — thousand short tons (Pb content)	1,440	29.1	29.7	58.8	22.9	5.7	8.2	------	36.8	4.4
Magnesium — short tons (Mg content)	26,293	59.8	18.9	78.7	------	------	1.1	------	1.1	20.2
Manganese — thousand short tons (Mn content)	1,205	15.5	------	15.5	2.5	9.0	67.1	2.9	81.5	3.0
Molybdenum — thousand pounds (Mo content)	37,317	65.4	------	65.4	------	------	------	------	------	34.6
Nickel — short tons (Ni content)	93,167	1.0	5.1	6.1	90.1	------	2.2	------	92.3	1.6
Petroleum, crude — million barrels	2,117	93.3	------	93.3	------	4.9	1.6	------	6.5	0.2
Phosphate rock — thousand long tons (gross weight)	8,509	100.0	------	100.0	------	------	------	------	------	------
Potash — thousand short tons (K_2O equivalent)	1,410	90.6	------	90.6	------	------	8.0	1.4	9.4	------
Salt, common — thousand short tons	16,434	100.0	------	100.0	------	------	------	------	------	------
Sulfur — thousand long tons (S content)	4,949	93.1	------	93.1	------	------	------	------	------	6.9
Tin — long tons (Sn content)	129,883	(6)	18.2	18.2	0.1	11.0	69.4	1.3	81.8	------
Tungsten ore and concentrates[7] — short tons (gross weight)	20,850	19.7	------	19.7	1.1	15.8	26.4	37.0	80.3	------
Zinc — thousand short tons (Zn content)	1,149	51.2	6.4	57.6	29.5	2.0	1.6	(6)	33.1	9.3

[1] For derivation, *see* table 2.
[2] Deduction for net export has been prorated among other sources of supply. Where there is an over-all net import, but a net export to a particular country group, the deduction for such net export is prorated among the net imports from other country groups.
[3] Deduction for net increase in stocks has been prorated among other sources of supply.
[4] From "old" scrap only, that is, from material previously in use.
[5] Other countries outside U. S. S. R. bloc.
[6] Less than 0.05 percent.
[7] 60 percent WO_3 basis.

For another group of the minerals covered—bauxite, chromite, cobalt, manganese, nickel, tin, and tungsten—over half of 1950 requirements were met out of imports, and for five of these—chromite, cobalt, manganese, tin, and tungsten—the bulk of the supply came from outside the Western Hemisphere. Except for these five, there were no minerals whose consumption in 1950 was met by as much as 20 percent from sources outside the Western Hemisphere. Tungsten was the only mineral for which we depended for more than 5 percent of our supply on countries now within the Soviet orbit.

Orders, Sales, and Inventories.—The Department of Commerce series on manufacturers' new orders, unfilled orders, sales, and inventories indicates greater expansion of sales and orders for iron and steel products in 1950 than for nonferrous. On the other hand, a much greater backlog of unfilled orders accumulated in the nonferrous-metal industries. Sales, inventory, and orders data for the industry groups processing mineral products, compared with durable-goods manufacture and manufacturing as a whole, are shown in table 4.

Table 4.—Variations in monthly value of manufacturers' sales, inventories, and orders in 1950 [1]

	Increase from Dec. 1949 to Dec. 1950, percent			
	Sales	Month-end inventories	Orders: New	Orders: Unfilled at month end
All manufacturing	35	18	45	92
Durable goods	50	18	64	92
Iron and steel and products	52	16	64	83
Nonferrous metals and products	55	7	41	140
Stone, clay, and glass products	45	11	(2)	(2)
Petroleum and coal products	20	(3)	(2)	(2)

[1] Based on U. S. Department of Commerce figures, published currently in Survey of Current Business.
[2] Not available.
[3] Slight decrease.

Stocks.—Physical stocks did not increase as much as book value of inventories over the year. For all United States industries (including trade) in 1950, the annual average physical increase in inventories was about 8 percent, but the value increase, 20 percent. Stocks of most important minerals declined from the unusual highs reached in the 1949 slump. The principal exceptions were stocks of anthracite (producers'), gasoline, pig tin, and superphosphates. Many mineral stocks fell below even those of the 1948 boom year: Bituminous coal, coke, residual fuel oil, iron ore (docks and furnaces), refined copper, slab zinc, sulfur, and pig tin. Particularly drastic declines occurred in stocks of the major nonferrous metals following the outbreak of hostilities in Korea.

LABOR

Employment and Unemployment.—Average total mining employment, according to Bureau of Labor Statistics data, was about 28,000 persons less in 1950 than in 1949, largely as a result of a reduced annual average employment of 23,000 in bituminous-coal mining. The slight increase in nonfuel, nonmetal employment was more than balanced by decreases in anthracite mining and in oil-field employment. Metal-mining employment increased slightly during the year.

Bureau of Mines data on average number of men working daily (computed on an active mine-days basis) show similar trends. According to these data, which include metallurgical plants, total mineral-industry employment declined about 2 percent between 1949 and 1950. Most of the decline in the Bureau of Mines series, however, was in metal mining and manufacturing, with the decline in coal mining a secondary contributor.

Unemployment statistics are seldom as firm as employment data but clearly show decreased unemployment from 1949 to 1950—from 8.0 to 6.2 percent of workers in the industry. In 1948, however, the rate had been only 2.3 percent.

Hours of Work.—The average workday, according to Bureau of Mines accident-exposure data, was virtually unchanged from 1949 at 7.9 hours. However, the mineral industry as a whole was active on more days during the year so that, despite the decline in average employment, total man-days and man-hours increased about 8 percent, activity in coal mines leading the way with a 12-percent increase.

Average weekly hours, according to the Bureau of Labor Statistics measurements of time paid for (including vacations, sick leave, and holidays), increased in all mineral industries. The greatest increase was in coal mining, even though annual average employment decreased. For industries where employment was greater in 1950, the percentage increases in weekly hours were about double the increases in employment. This lengthening of workweek persisted strongly throughout the year in both metal and coal mining; by December the workweek for copper mining reached 47.2 hours. The average workweek for the year for all mining was still a little less than 40 hours because of coal.

Payrolls.—Labor costs, for most analytical purposes, consist of payrolls and certain "supplements" to wages and salaries. Tabulations of other labor costs of a welfare nature are so rarely available in published form other than annually that they generally cannot be considered in industry-wide analyses.

The payroll increase in 1950 for coal mining was due primarily to increases in hours worked and to a lesser extent to increased hourly rates. For other mining industries, these two effects were approximately equal.

Increases in supplements to wages and salaries in mining industries were unusually large in 1950 owing primarily to the bargaining successes enjoyed by the bituminous-coal workers, which raised supplements to 13.5 percent of payrolls. Other big increases were obtained in nonmetallic mining, nonferrous-metal refining, and the stone, clay, and glass industries, but supplements for all of these were only about 5 percent of payrolls (as they were for metallic-mining and oil-field employees). Oil-refinery workers obtained the smallest increase (6 percent) in supplements, but their supplements were already about the highest of any industry (20 percent). (The average for all industries was 5 percent.)[5]

[5] Work cited in footnote 2, p. 163.

Hourly Earnings.—Average hourly earnings increased in all mineral industries, averaging 2.2 to 4.4 percent higher than in 1949. In metal mining the gains in hourly earnings until August represented largely a recovery from the decline in the fall of 1949. For other mining industries the 1949 decline had been less marked, and the monthly growth in 1950 was less regular. Mineral-manufacturing hourly earnings gained about twice as much during 1950 as those in mining industries and had the added advantage of having been less affected by the 1949 slump.

Despite general business declines in 1938, 1946, and 1949, annual average hourly earnings have increased in all mining industries for each year since 1933, except for a small decline in the 1938 figure for metal mining.

Productivity.—According to Bureau of Labor Statistics data, there was a substantial increase in annual average output per man-hour in 1950 over 1949 for most mining industries. The exception was anthracite mining, where productivity declined 3.8 percent to reach the lowest level in 14 years. The increase in mining as a whole to a level 5.7 percent above the previous high in 1947 apparently was due to the addition of machinery and the catching up on development work that took place during 1949, the only significant postwar year of minerals recession. Bituminous-coal output per man-hour was 12 percent above 1949, copper (recoverable metal) 12 percent, iron ore (usable) 7 percent, lead and zinc (recoverable metal) 11 percent, and mining as a whole (including gas and oil production) 8 percent. If output were based on ore mined rather than recoverable metal, the increase in productivity for copper, iron, and lead and zinc would be 15, 10, and 12 percent, respectively.

Bureau of Mines productivity data for the bituminous-coal industry, based on tons per man-day, show a similar trend in 1949–50 to the BLS data, except that the increase was only 5 percent.

Health and Safety.—Fatalities in the mineral industries in 1950 increased by 72 over the preceding year, and nonfatal injuries increased 1,674. Because of the increase in aggregate man-hours worked, however, the over-all accident-frequency rate declined from 44.71 (in 1949) to 42.86 (in 1950) per million man-hours of exposure. The fatality-frequency rate, while slightly higher than in 1949, was the second lowest on record, and the nonfatal-injury-frequency rate the lowest. For the second straight year, there was no major disaster in the mineral industries.

TRANSPORTATION

Railroad transportation of minerals increased somewhat more than mineral output, both in terms of annual averages and of monthly variation between January and December. This was due to the fact that petroleum, whose output is much more stable, from a seasonal standpoint, than that of other minerals, is shipped by railroad only to a slight degree. Seasonally adjusted monthly carloadings of metal ore more or less followed the Federal Reserve Board seasonally adjusted monthly index of metallic-mineral production, with an apparent small slump in March and April (due to the effects of a late spring on adjusted statistics) after the deep trough in October and November 1949. (It is necessary to use adjusted statistics of ore carloadings to detect the underlying change, because winter carloadings fall to one-tenth of summer loadings.) The same close relationship was true of coal carloadings and monthly production; the 1950 dips for coal were actual and occurred at different times—February and July. Annual freight revenue per ton of mineral freight originated rose 4 percent, continuing the steady increase since the low of 1946.

Oil-pipeline transportation increased over 1949 more than domestic crude production. Although crude-oil production increased 7.1 percent, the number of barrels of oil originated on line and received from connections increased 11.1 percent and oil-pipeline transportation revenue increased 16.6 percent. Annual discrepancies of this size are typical. However, the longer-run increases in oil production and pipeline transportation are comparable; between 1943 and 1950 each increased around 30 percent. Annual movements of pipeline revenues and pipeline volume matched closely from 1942 to 1948, after which revenues rose 17.1 percent from 1948 to 1950, while volume increased only 1.7 percent.

PRICES AND COSTS

The annual average of mineral prices was little changed in 1950 from that in 1949; furthermore, for many mineral products there was little change during the year. This is shown both by annual output and value reports to the Bureau of Mines and by the mineral price indexes of the Bureau of Labor Statistics. Estimates of price increases between 1949 and 1950, based on Bureau of Mines data, are: 1.0 percent for all minerals, 0.4 percent for fuels, 4.6 percent for metals, and 1.6 percent for nonmetals (other than fuels). The Bureau of Labor Statistics indexes show decreased prices for crude petroleum, natural gas, fertilizer materials, and manufactured fertilizers. Metal prices were higher.

The monthly behavior of prices varied. The BLS index for nonferrous metals hit a low in March 1950, after which it rose 43 percent by December, but this was only 5.8 percent above January 1949. There was almost no change (0.6-percent increase) in crude petroleum over the year, a slight decrease (1.5 percent) in the bituminous-coal index, a 4.6-percent increase in anthracite, a 6.1-percent increase in natural gas, and a 7.9-percent increase in petroleum products. The price of iron ore was jumped twice during the year, ending up 15 percent higher than it started.

The cost of mining materials per unit of input, as shown in a general way by various wholesale price indexes, increased during the year. The 1950 cost of fuel and power averaged about 1 percent over 1949, metal fabricated products about 2 percent, and lumber about 14 percent. The lumber index, which is notoriously volatile, rose about 22 percent between the beginning and the end of the year. The price of blasting powder rose sharply in December 1950, just before the price freeze, after over 2 years of great stability. The lesser percentage increase in average hourly earnings than in man-hour productivity (discussed above) indicates generally lower labor costs per unit output in 1950 compared with 1949.

INCOME AND CAPITAL EXPENDITURE

Income and Dividends.—Corporate income before Federal and State profit taxes increased significantly for all mineral industries, but increases for mineral manufacturing were about twice as much as for mineral mining. Fourth-quarter mining earnings before taxes doubled first-quarter earnings. Taxes comprised a 16-percent larger share of income before taxes in 1950 than in 1949 (increasing from 26.5 to 30.7 percent for mining industries). The increase in income after taxes was therefore somewhat less than in income before taxes.[6]

Except for coal mining, dividends paid by corporations were almost exactly the same share of income after taxes for each mineral industry as they were in 1949. They averaged one-third but were one-half for metal mining and one-fourth for bituminous coal.[7]

The much smaller income of unincorporated mineral enterprises apparently increased percentagewise somewhat more than that of corporations, but these data are less reliable than those for corporations. The large group of unincorporated crude-petroleum enterprises more than doubled the percentage increase in income experienced by incorporated enterprises in crude petroleum.[8]

Investment.—Expenditures on plant and equipment by mining industries continued downward in 1950 on an annual basis, although the quarterly figure rose after the first-quarter low, when it was only 83 percent of 1948 and was lower than at any time since the first quarter of 1947. A similar quarterly trend held for fuels (petroleum refining and coal products) and for primary metal manufacturing. Applications in the fall of the year for Government assistance in the form of accelerated tax amortization indicated a prospective rapid increase in investment, with iron and steel in front and petroleum, metal mining, and coke and coal substantially ahead of nonmetallic raw materials.

The bulk of crude-mineral capital expenditure in 1950 (expenditure by mining companies, plus that on crude petroleum) was for crude-petroleum production; however, capital expenditure in this sector was the smallest since 1948. The value for 30 large companies was $1,193 million, 72 percent of 1948.[9] The reduction from 1948 in mineral-industry capital expenditures closely paralleled that of industry in general, but the timing differed from that in durable manufactured goods and in manufacturing as a whole in that the latter experienced their reduction all in 1949.

FOREIGN TRADE AND INVESTMENT

Foreign Trade.—As might be expected from increased industrial activity and the drive to accumulate inventory after the outbreak of hostilities in Korea, imports of mineral raw materials were generally higher in 1950 than in 1949. Exports, on the other hand, because of the increased rates of domestic consumption, as a whole

[6] Work cited in footnote 2, pp. 167–171.
[7] Work cited in footnote 2, p. 173.
[8] Work cited in footnote 2, pp. 165, 167.
[9] Coqueron, F. G., and Pogue, J. E., Financial Analysis of Thirty Oil Companies for 1950: Chase National Bank of the City of New York, Petroleum Dept., June 1951, 23 pp.

showed no upward tendency and in a number of individual instances dropped sharply.

Metals in particular showed the effect of defense mobilization. Imports as a whole rose abruptly, and there was a pronounced shift from imports of ore and concentrate to imports of metal and other advanced forms. While receipts of bauxite, for example, were slightly lower, those of aluminum metal more than doubled. Imports of copper in ore and concentrate were off by about one-third and in semi-refined form by 7 percent, but imports of refined copper rose 18 percent, receipts of copper scrap more than quintupled, and those of copper manufactures also increased. Similarly, imports of lead in ore and concentrate were nearly one-third lower, while imports as metal, alloy, or scrap increased by three-fifths. Zinc, a partial exception to the general rule, was imported in increased quantity in all forms, including ore and concentrate.

Imports of crude steel nearly quadrupled in 1950, and those of basic steel-mill products were nearly five times as great as in 1949. Exports of crude steel, on the other hand, fell to less than one-fourth of those in 1949, while exports of castings and forgings and of other steel-mill products fell over one-third.

Fuel imports also responded to the increased industrial activity. Crude-oil receipts increased 14 percent and those of residual fuel oil nearly 60 percent. Exports of crude petroleum increased roughly half, but not enough in absolute amount to outweigh the increase in imports. Exports of fuel oil also increased somewhat, but those of motor fuel declined substantially. Exports of natural gas and of natural-gas liquids each increased by about one-fifth. Exports of bituminous coal, which had dropped markedly in 1949, declined still further in 1950, while exports of coke continued their very marked decline of recent years.

The record on nonmetallics was similar to that for metals with regard to imports but was somewhat mixed on the export side. There were substantial increases in imports of industrial diamonds and other abrasives, asbestos, and mica. Exports of sulfur, on which the rest of the world largely depends, increased substantially. Exports of phosphate rock—many times imports of the same material—increased, but those of other phosphates declined. Potash exports declined slightly, as imports increased ninefold to create a net import balance. Imports and exports of nitrogen compounds, which are roughly on the same level, increased slightly and decreased slightly, respectively.

Details on United States imports and exports of minerals in 1950 will be found in tables 5 and 6.

TABLE 5.—Imports for consumption of mineral products by the United States, 1948–50 [1]

[U. S. Department of Commerce]

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
METALS						
Aluminum:						
Bauxite..........thousand short tons (dried equivalent)..	2,865	3,058	2,843	15,821	16,353	15,719
Metal..........short tons..	160,881	125,326	255,692	41,799	36,082	67,533
Compounds..........do....	5,566	1,648	3,330	128	66	147
Manufactures..........	(2)	(2)	(2)	404	723	1,032
Antimony:						
Ore..........short tons (Sb content)..	13,464	7,473	9,746	4,312	2,488	1,850
Metal..........short tons..	3,734	1,934	4,651	2,337	1,285	2,213
Arsenic:						
Metal..........do....	18	23	69	18	19	57
Oxide (white arsenic)..........do....	9,336	4,696	14,774	884	565	1,426
Beryllium ore..........do....	1,720	3,811	4,683	299	858	1,182
Bismuth metal..........do....	150	271	391	465	834	1,287
Cadmium:						
Flue dust....short tons (Cd content)..	914	895	801	1,438	1,596	1,519
Metal..........short tons..	5	79	315	22	303	1,504
Calcium metal..........do....	(3)	2	38	2	5	66
Chromium:						
Chromite..short tons (Cr_2O_3 content)..	680,723	532,072	581,804	33,010	24,200	23,288
Ferrochromium short tons (Cr content)..	4,714	4,012	13,768	1,471	1,280	4,530
Cobalt:						
Ore and concentrate short tons (Co content)..	1,275	855	925	2,523	2,011	2,240
Metal..........short tons..	2,642	2,794	3,353	7,744	8,999	10,953
Compounds..........do....	388	180	471	817	386	1,040
Columbium ore and concentrate....do....	987	779	863	659	562	753
Copper: [4]						
Ore and concentrate short tons (Cu content)..	63,302	127,404	94,301	24,927	48,400	35,899
Semirefined metal and alloys...do....	163,318	156,191	145,265	65,896	56,618	53,098
Refined metal and alloys..........do....	253,615	278,477	327,524	108,528	111,590	132,232
Scrap..........do....	9,334	6,765	38,761	3,249	2,437	13,120
Manufactures..........do....	41,137	26,596	44,477	20,040	10,499	18,978
Gold:						
Ore and base bullion..thousand troy ounces (Au content)..	1,006	1,035	906	35,136	36,160	31,645
Bullion..........do....	54,255	21,006	3,746	1,898,916	735,210	131,099
Alloy (coin)..........do....	----------	----------	----------	47,123	20	5
Iron and steel:						
Ore..........thousand short tons..	6,842	8,287	9,293	27,330	36,735	44,027
Pig or sponge iron and iron and steel scrap..........thousand short tons..	657	1,209	1,550	23,323	33,902	45,012
Crude steel..........short tons..	23,334	52,972	194,682	1,427	3,540	11,719
Semimanufactures..........do....	47,188	108,758	510,461	5,548	10,901	37,556
Lead:						
Ore, concentrate, flue dust, etc.[5] short tons (Pb content)..	33,976	122,224	96,134	8,353	34,526	21,184
Metal, alloy, and scrap [6]..........do....	297,895	292,982	471,708	97,985	87,243	114,733
Manufactures..........short tons..	232	203	342	136	131	157
Magnesium metal..........do....	678	2,560	843	184	537	218
Manganese:						
Ore [7]..........short tons (Mn content)..	702,776	673,671	922,283	23,339	26,798	41,882
Alloys..........do....	78,426	52,169	87,692	14,517	11,307	16,280
Mercury metal..........flasks (76 pounds)..	31,951	103,141	56,080	1,567	6,762	2,694
Nickel:						
Ore, oxide, and matte.....short tons..	35,368	23,370	27,442	13,577	11,183	18,097
Metal and scrap..........do....	71,567	73,774	69,794	47,454	54,833	58,820
Compounds..........do....	21,514	12,242	16,306	10,001	6,585	10,488
Platinum group:						
Ore and concentrate....troy ounces (platinum-group-metal content)..	1,893	505	628	163	18	26
Metal..........do....	270,840	217,779	427,006	14,811	11,837	23,186
Radium: Salts..........milligrams..	77,018	98,032	80,969	1,385	1,720	1,236
Selenium..........short tons..	134	86	182	490	317	768
Silver:						
Ore and base bullion thousand troy ounces (Ag content)..	35,339	31,998	33,899	25,698	22,566	24,494
Bullion..........do....	49,636	63,794	74,150	36,911	45,656	54,979
Alloy (coin)..........do....	----------	----------	----------	8,275	5,313	30,562
Silicon metal and alloys.......short tons..	7,614	7,652	14,998	258	323	810
Tantalum ore..........do....	64	68	164	83	237	244

For footnotes, *see* end of table.

TABLE 5.—Imports for consumption of mineral products by the United States. 1948–50 [1]—Continued

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
METALS—continued						
Tin:						
Concentrate..short tons (Sn content)	41,991	42,908	29,075	72,170	78,176	47,163
Metal and scrap...do	55,100	67,451	92,777	103,323	133,707	152,903
Titanium:						
Ilmenite...short tons	242,119	324,157	216,459	1,759	2,479	1,199
Rutile...do	8,771	3,085	3,427	589	180	150
Ferrotitanium...do	28	38	130	17	20	81
Tungsten:						
Ore and concentrate [8] short tons (W content)	4,237	3,344	8,074	8,716	6,390	15,309
Metal and carbide...do	(3)	7	106	(9)	22	322
Ferrotungsten and alloys...do	----------	23	690	----------	31	1,083
Compounds...do	----------	----------	2	----------	----------	2
Vanadium ore and concentrate short tons (V content)	526	276	729	534	272	709
Zinc:						
Ore and concentrate [10] short tons (Zn content)	174,452	155,598	248,402	14,702	16,008	25,921
Metal...short tons	92,536	125,581	155,804	24,917	29,345	38,840
Scrap...do	10,273	3,733	2,862	1,181	559	688
Manufactures...do	(2)	(2)	(2)	49	11	235
Zirconium ore...do	18,154	20,833	16,826	571	637	431
FUELS						
Anthracite...short tons	945	----------	18,289	7	----------	255
Bituminous coal...do	291,337	314,980	346,706	2,003	2,368	2,369
Coke...do	161,400	277,507	437,585	2,110	3,976	5,297
Fuel briquets...do	329	365	804	3	3	2
Petroleum, crude and semirefined thousand barrels (42 gallons)	128,868	159,129	181,432	284,215	348,108	381,548
Petroleum products:						
Motor fuel...do	427	23	197	1,818	119	879
Kerosine and naphtha...do	152	1	302	579	27	956
Gas oil and distillate fuel oil...do	2,552	2,365	3,031	5,853	4,700	6,638
Residual fuel oil...do	55,536	77,612	123,037	118,193	122,194	190,273
Lubricating oils...do	102	(11)	1	278	5	14
Other...do	1,589	1,178	1,780	2,566	2,635	3,528
NONMETALLIC MINERALS						
Abrasives:						
Diamonds, industrial thousand carats	10,649	6,381	10,967	33,269	17,723	35,446
Other natural [12]...short tons	25,607	21,250	62,016	978	644	1,079
Artificial...do	174,672	129,548	158,543	10,918	8,023	10,547
Asbestos, unmanufactured...do	647,881	509,366	705,253	37,974	33,940	47,250
Asphalt and related bitumens, natural short tons	4,857	4,109	5,863	167	88	136
Barium:						
Barite...do	53,204	26,389	59,059	444	195	442
Witherite...do	2,470	2,113	2,089	95	63	51
Compounds...do	152	108	1,724	21	16	246
Boron minerals and compounds...do	18	15	22	33	36	35
Bromine and compounds...do	(3)	(3)	(3)	40	20	16
Calcium chloride...do	5	1	1,881	(9)	(9)	54
Carbon black...do	5,110	3,926	4,981	1,294	984	1,146
Cement...do	53,188	20,652	262,082	797	336	3,614
Clay, raw...do	135,941	105,105	161,261	2,124	1,481	2,001
Cornwall stone...do	1,390	887	1,388	18	12	14
Cryolite...do	2,353	20,506	17,134	210	1,312	978
Feldspar...do	34,773	17,725	13,851	220	108	84
Fluorspar...do	111,626	95,619	164,634	1,825	1,549	2,580
Gem stones:						
Diamonds, gem...thousand carats	1,298	969	1,312	100,645	69,674	103,301
Emeralds...carats	16,150	93,054	21,848	315	511	245
Other	(2)	(2)	(2)	14,980	13,947	16,095
Graphite...short tons	52,317	31,805	43,669	2,046	1,260	2,080
Gypsum:						
Crude, ground, and calcined thousand short tons	2,860	2,594	3,192	2,992	2,716	3,280
Manufactures	(2)	(2)	(2)	122	135	284
Iodine...short tons	296	245	362	848	720	1,056
Kyanite...do	17,091	12,119	17,417	259	325	588

For footnotes, *see* end of table.

TABLE 5.—Imports for consumption of mineral products by the United States, 1948–50[1]—Continued

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
NONMETALLIC MINERALS—con.						
Lime:						
Hydrated ..... short tons..	2,861	1,674	1,253	48	35	24
Other ..... do....	30,336	30,807	30,904	401	546	524
Magnesium:						
Magnesite ..... do....	4,060	3,955	16,254	342	241	905
Compounds ..... do....	297	565	2,362	91	80	122
Meerschaum ..... do....	2	3	5	10	14	19
Mica:						
Uncut sheet and punch ..... do....	1,415	1,233	1,667	2,478	2,111	3,087
Scrap ..... do....	7,124	1,758	4,402	108	22	59
Manufactures ..... do....	9,357	9,747	12,441	12,961	17,212	20,507
Mineral earth pigments ..... do....	4,929	4,137	9,174	343	296	585
Mineral wax (ozokerite, etc.) ..... do....	402	893	1,171	261	310	481
Nepheline syenite ..... do....	61,147	59,994	63,208	346	416	739
Nitrogen compounds thousand short tons..	1,048	1,079	1,154	39,659	46,401	47,701
Peat ..... short tons..	91,073	94,747	124,864	3,195	3,184	3,866
Phosphorus:						
Phosphate rock ..... do....	53,876	72,678	97,634	609	822	1,114
Phosphatic fertilizers ..... do....	120,708	162,457	158,041	6,663	9,220	8,136
Potash ..... short tons (K_2O equivalent)..	27,181	19,216	199,493	3,064	2,359	13,995
Pyrites ..... short tons..	120,300	135,449	233,818	260	252	412
Quartz crystal ..... thousand pounds..	1,239	320	310	4,210	1,462	791
Salt ..... short tons..	5,621	6,309	7,869	41	61	59
Sand and gravel:						
Glass sand ..... do....	16,914	11,491	9,191	24	20	25
Other sand ..... do....	336,898	287,452	290,025	302	277	266
Gravel ..... do....	89,174	135,227	146,079	30	19	29
Slate	(2)	(2)	(2)	14	21	98
Sodium sulfate ..... short tons..	29,612	21,388	67,177	469	300	844
Stone	(13)	(13)	(13)	2,073	2,139	2,660
Strontium minerals ..... short tons..	21,771	9,384	8,630	559	177	142
Sulfur ..... do....	43	36	28	13	6	6
Talc:						
Unmanufactured ..... do....	18,377	18,816	23,387	519	577	692
Manufactures	(2)	(2)	(2)	15	9	8

[1] Table does not include certain minerals or mineral manufactures of relatively small importance or for which adequately differentiated statistics do not exist.
[2] Data not available.
[3] Less than 0.5 ton.
[4] Includes copper for smelting or refining and export as follows:

	Quantity (short tons)			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
Ore and concentrate	16,070	6,093	6,501	7,074	2,827	2,884
Semirefined metal and alloys	2,603	448	23,796	1,137	200	11,204
Refined copper and alloys	------	-----	918	-----	-----	425
Scrap	------	-----	4,518	-----	-----	2,010

[5] Includes lead for smelting or refining and export as follows: 1948—44 short tons, $2,089; 1949—377 tons, $128,810; 1950—1,066 tons, $138,466. Does not include lead recorded as "nonrecoverable" as follows: 1948—43 short tons; 1949—56 tons; 1950—453 tons.
[6] Includes lead for smelting or refining and export as follows: 1948—38 short tons, $9,491; 1949—3 tons, $592; 1950—206 tons, $89,179.
[7] Includes manganese for smelting or refining and export as follows: 1948—412 short tons, $10,903; 1949—831 tons, $32,558; 1950—66 tons, $2,407.
[8] Includes tungsten for smelting or refining and export as follows: 1948—909 short tons, $938,668; 1949—207 tons, $434,078.
[9] Less than $500.
[10] Includes zinc for smelting or refining and export as follows: 1948—40,637 short tons, $2,963,942; 1950—10,838 tons, $1,607,517. Does not include zinc recorded as "nonrecoverable" as follows: 1948—112 short tons 1949—87 tons; 1950—93 tons.
[11] Less than 500 barrels.
[12] Includes value of abrasive paper and cloth but excludes quantity because not available on tonnage basis.
[13] Quantity cannot be aggregated because of varying units.

TABLE 6.—Exports of mineral products from the United States, 1948–50 [1]

[U. S. Department of Commerce]

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
METALS						
Aluminum:						
Bauxite short tons (dried equivalent)	96,638	64,543	80,305	1,202	513	1,144
Metal short tons	49,546	37,179	21,284	29,037	21,455	11,029
Compounds do	17,881	18,861	17,403	1,067	1,219	1,205
Manufactures	(2)	(2)	(2)	14,183	11,470	11,124
Antimony:						
Ore and concentrate short tons	69	35	6	30	11	1
Metal and alloys do	258	450	148	181	337	86
Beryllium:						
Concentrate do	(3)	(3)	(3)	1	2	1
Metal and alloys do	13	94	110	48	482	308
Bismuth metal and alloys do	176	95	100	711	357	387
Cadmium:						
Metal do	478	283	176	1,872	1,264	795
Alloys do	1	2	5	3	6	12
Other do	46	(3)	----------	55	(4)	----------
Chromium:						
Chromite do	2,894	2,382	2,044	82	74	63
Ferrochromium short tons (Cr content)	6,754	2,200	347	2,371	943	134
Metal and nonferrous alloys short tons	162	24	26	278	56	54
Cobalt:						
Ore do	67	----------	(3)	182	----------	(4)
Metal do	(3)	82	80	2	56	82
Columbium concentrate do	(3)	9	55	2	12	50
Copper:						
Unrefined and semirefined short tons (Cu content)	2,473	200	616	1,029	79	223
Refined and semimanufactures short tons	207,022	195,990	192,339	110,284	95,263	86,712
Other copper manufactures	(2)	(2)	(2)	2,250	1,655	1,503
Brass and bronze short tons	[5] 20,107	[5] 23,538	[5] 16,256	22,442	20,564	17,189
Sulfate do	42,135	31,717	30,149	6,515	4,321	4,151
Gold:						
Ore and base bullion troy ounces (Au content)	----------	2,865	725	----------	97	34
Bullion thousand troy ounces (Au content)	5,233	2,169	14,633	186,995	80,644	514,249
Alloy (coin)	----------	----------	----------	113,776	4,194	19,752
Iron and steel:						
Ore thousand short tons	3,450	2,716	2,857	13,745	14,654	15,717
Pig iron and iron and steel scrap short tons	247,085	423,412	277,134	12,372	16,505	12,525
Crude steel do	219,341	257,248	61,612	16,737	21,546	4,963
Steel mill products thousand short tons	4,217	4,520	2,864	600,702	671,207	443,183
Iron and steel castings and forgings short tons	117,345	136,345	87,832	19,641	22,671	14,693
Lead:						
Metal do	1,626	2,715	5,241	783	1,048	1,420
Alloys do	1,315	1,470	1,425	852	1,014	899
Compounds do	3,279	3,528	3,496	1,404	1,344	1,166
Magnesium metal do	444	708	908	272	399	459
Manganese:						
Ore and concentrate do	9,236	5,033	8,962	687	354	458
Ferro-alloys do	19,747	6,627	943	2,993	1,360	161
Mercury metal flasks (76 pounds)	526	577	447	43	54	38
Molybdenum:						
Ore and concentrate short tons (Mo content)	2,066	2,660	3,117	2,999	4,624	5,454
Ferromolybdenum short tons	594	478	589	806	719	927
Metal and nonferrous alloys do	28	43	73	72	100	115
Nickel:						
Ore and matte do	1	26	6	2	4	2
Metal do	1,353	805	338	1,494	960	414
Alloys do	6,830	3,640	6,601	6,508	4,304	3,648
Manufactures	(2)	(2)	(2)	746	922	877
Platinum group:						
Ore and concentrate troy ounces (platinum-group-metal content)	5	165	82	1	2	(4)
Metal troy ounces	36,465	40,778	37,699	1,695	2,125	1,797
Silver:						
Ore and base bullion troy ounces (Ag content)	4,151	----------	----------	2	----------	----------
Bullion thousand troy ounces	1,281	3,007	4,598	951	2,180	3,563
Alloy (coin)	----------	----------	----------	11,447	21,101	2,639
Tantalum concentrate, metal, and alloys short tons	(3)	3	1	34	95	61

For footnotes, see end of table.

TABLE 6.—Exports of mineral products from the United States, 1948–50 [1]—Continued

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
METALS—continued						
Tin metal______short tons__	87	85	321	163	177	595
Titanium:						
Concentrate______do____	1,454	1,505	600	187	143	58
Ferrotitanium______do____	480	179	171	83	41	43
Compounds______do____	26,824	29,621	32,660	7,127	8,141	8,800
Tungsten:						
Ore and concentrate______do____	415	102	7	401	85	16
Ferrotungsten______do____	628	310	166	1,838	861	409
Metal and alloys______do____	91	53	76	1,363	1,188	1,394
Vanadium:						
Ore and concentrate short tons (V content)__	7	7	(3)	32	26	3
Ferrovanadium______short tons__	119	97	41	390	351	183
Metal and nonferrous alloys____do____	1	1	2	11	18	3
Zinc:						
Ore and concentrate [6] short tons (Zn content)__	3,547	2,925	1,140	422	478	265
Metal and scrap [6]______short tons__	73,772	68,425	24,445	19,443	22,682	7,150
Compounds______do____	29,657	19,500	12,451	5,229	3,426	2,124
Zirconium:						
Ore and concentrate______do____	312	305	525	24	24	26
Metal and alloys______do____	11	37	29	8	13	19
FUELS						
Anthracite______thousand short tons__	6,676	4,943	3,892	86,203	64,786	62,502
Bituminous coal______do____	45,930	27,842	25,468	392,906	232,393	206,545
Coke______short tons__	706,782	548,256	397,801	10,591	8,323	6,159
Fuel briquets______do____	207,885	167,140	175,768	2,654	2,438	2,617
Natural gas______million cubic feet__	5,645	19,615	23,474	1,115	1,986	2,323
Natural-gas liquids:						
Natural gasoline thousand barrels (42 gallons)__	4,066	4,363	999	20,126	17,465	3,581
LP-gases______thousand gallons__	45,520	53,383	67,763	5,259	5,777	5,748
Petroleum, crude and semirefined thousand barrels (42 gallons)__	39,737	33,088	34,892	116,763	98,527	103,171
Petroleum products:						
Motor fuel thousand barrels (42 gallons)__	27,163	28,410	16,908	133,536	146,498	89,958
Kerosene and naptha______do____	4,353	2,892	2,301	18,730	13,371	11,357
Gas oil and distillate fuel oil____do____	18,451	10,011	10,483	68,631	33,183	33,178
Residual fuel oil______do____	9,469	8,548	11,885	22,692	14,102	18,111
Lubricating oils______do____	12,857	12,318	13,616	198,265	168,903	173,606
Other______	(2)	(2)	(2)	72,060	62,038	58,441
NONMETALLIC MINERALS						
Abrasives, natural and artificial, including manufactures______	(7)	(7)	(7)	14,665	16,984	15,612
Asbestos:						
Unmanufactured______short tons__	6,530	17,621	18,901	1,173	3,619	3,619
Manufactures______	(2)	(2)	(2)	9,321	9,667	8,112
Asphalt and related bitumens, natural short tons__	13,682	16,672	18,817	559	823	931
Boron minerals and compounds____do____	70,940	109,491	142,580	4,075	6,863	8,301
Bromine and compounds______do____	527	463	435	433	403	401
Calcium chloride______do____	11,456	21,094	15,624	438	508	403
Carbon black______do____	160,957	151,622	199,784	28,524	26,800	33,879
Cement___thousand barrels (376 pounds)__	5,922	4,562	2,418	20,917	15,961	7,275
Clay, raw______short tons__	266,849	244,883	238,120	5,138	4,796	4,998
Cryolite______do____	728	363	2,072	143	78	405
Fluorspar______do____	644	783	728	25	33	30
Graphite______do____	1,047	1,352	1,397	128	159	174
Gypsum:						
Crude, ground, and calcined____do____	10,797	17,567	23,678	260	423	525
Manufactures______	(2)	(2)	(2)	1,057	1,513	522
Kyanite______short tons__	462	1,039	941	22	47	36
Lime______do____	63,088	59,927	50,491	865	937	826
Mica______do____	1,403	1,108	1,547	720	677	860
Mineral earth pigments______do____	6,929	6,443	5,568	1,002	827	713
Mineral wax (ozokerite, etc.)______do____	6,110	1,511	989	2,099	584	314
Nitrogen compounds thousand short tons__	864	1,179	1,001	52,589	62,895	45,176
Phosphorus:						
Phosphate rock______do____	1,278	1,409	2,052	10,485	11,405	14,874
Phosphatic fertilizers____short tons__	429,902	357,519	273,181	8,385	6,551	5,332

For footnotes, *see* end of table.

TABLE 6.—Exports of mineral products from the United States, 1948–50 [1]—Continued

	Quantity			Value (thousand dollars)		
	1948	1949	1950	1948	1949	1950
NONMETALLIC MINERALS—con.						
Potash.....short tons (K_2O equivalent)..	69,733	69,557	65,047	8,289	7,110	5,534
Salt.....short tons..	387,601	359,776	190,377	5,930	3,353	1,776
Slate	(2)	(2)	(2)	587	595	614
Sodium carbonate.....short tons..	207,090	75,585	63,497	9,654	2,818	2,173
Stone	(2)	(2)	(2)	1,015	960	717
Sulfur:						
Crude.....thousand short tons..	1,414	1,603	1,614	26,779	30,490	30,951
Refined.....short tons..	36,546	33,751	42,029	1,774	1,683	2,249
Talc:						
Unmanufactured.....do....	16,327	15,840	20,593	432	440	561
Manufactures [8]	(2)	(2)	(2)	2,229	1,637	1,260

[1] Table does not include certain minerals or mineral manufactures of relatively small importance or for which adequately differentiated statistics do not exist.
[2] Not available.
[3] Less than 0.5 ton.
[4] Less than $500.
[5] Weight of certain brass and bronze manufactures valued at $6,337,009 in 1948; $5,499,295 in 1949, and $5,175,294 in 1950, is not recorded and therefore omitted from the quantity figures only.
[6] Dross included with "ore and concentrate" during 1948, but with "metal and scrap" in 1949–50.
[7] Quantity cannot be aggregated because of varying units.
[8] Includes face and body powders.

Tariffs.—Reduced rates of import duty came into effect in the first half of 1950, as the result of trade-agreement negotiations at Annecy, France, in the summer of 1949, on boric acid, ammonium-chrome alum, mercury compounds, siennas, caustic potash and caustic soda, pumice and pumice products, talc, various types of earthenware, certain types of marble and breccia, manufactured or semimanufactured alabaster, granite, travertine, miscellaneous monumental and building stones, slate (other than roofing), ferrochrome, and various iron and steel products.

Further trade-agreement negotiations were undertaken at Torquay, England, in September 1950, with such items under discussion as coal-tar derivatives; resublimed iodine; phosphorus; mineral-earth pigments; crude and ground barite; brick, tile, clays, and earthenware; feldspar, mica, talc, and fluorspar; granite; pig iron, various ferroalloys, and various iron and steel products; titanium, barium, boron, strontium, thorium, vanadium, calcium, zirconium, and various alloys thereof; crude aluminum and alloys; bismuth; lead ore, matte, metal, and various products; zinc ore and metal; and compounds of ammonium, barium, cobalt, lead, zinc, tin, magnesium, potassium, sodium, strontium, thorium, and cerium.

By an exchange of notes on June 23, 1950, the United States and Mexico agreed that the 1943 Trade Agreement between the two countries would cease to be in force after December 31, 1950. The most important result was to cause the reduced import tax on crude petroleum, topped crude, and fuel oil to become subject once more to the quota arrangement applicable under the earlier Venezuela agreement, whereby the reduced rate of 10½ cents a barrel was limited each year to an amount equal to 5 percent of the quantity of crude processed in United States refineries in the preceding calendar year. For certain other commodities in the Mexican agreement, including fluorspar, lead ore, and various lead products, the duty reverted to the rate specified in the Tariff Act of 1930. Because it had been "bound" in the General Agreement on Tariffs and Trade (Geneva negotiations), the rate on zinc in ore and other forms did not change.

Because of Chinese withdrawal from the General Agreement on Tariffs and Trade, the United States withdrew, effective December 11, 1950, certain concessions it had originally negotiated with that country. As a result, rates of duty were increased on tungsten ore and concentrate, antimony metal, and certain manufactures of talc and other nonmetallic minerals.

Applications for relief under the trade-agreement "escape" procedure were brought early in 1950 by both the Reynolds Metal Co. and Kaiser Aluminum & Chemical Corp. with respect to the tariff on crude aluminum and aluminum-mill products; both were dismissed later in the year by the Tariff Commission after preliminary inquiry. Similar applications with respect to lead ore, bullion, and scrap were filed in May by the Emergency Lead Committee (New York) and the New Mexico Miners and Prospectors Association, but these two were also dismissed in January 1951 after preliminary inquiry.

The import tax on refined copper and copper in ore, etc., reverted to 2 cents per pound on July 1, 1950, when Congress declined to extend the previous suspension. The duty suspension on metal scrap, on the other hand, which had expired July 1, 1949, was reinstated October 1, 1950, until July 1, 1951.

Economic Cooperation Administration.—The Economic Cooperation Administration in 1950 continued to spend heavily, and this had a substantial effect on international mineral production, consumption, and capacity. Loans for expanding strategic mineral production and purchases of strategic minerals with counterpart funds provided direct stimulus to production expansion; indirect effects were achieved by using commodity-procurement authorizations by assisted countries to buy mineral products.[10]

Loans totaling about $36 million were approved for projects in ECA countries and their dependent territories to produce strategic minerals. Repayment was to be in the form of aluminum, lead, zinc, diamonds, copper, nickel, chromite, and tin for the United States National Stockpile. By far the largest of the 14 such projects was one for development of bauxite in Jamaica. The next largest loan was for further assistance to lead-zinc mining at Bou Beker, French Morocco.

Commitments were made by ECA in 1950 for purchasing over $25 million worth of strategic minerals (diamonds, ferromanganese, platinum, lead, fluorspar, mica, aluminum, and cobalt) in ECA countries and their dependencies. The big bulk of this was for payment from "5-percent counterpart" funds, representing local currency set aside by assisted countries for the use of the United States.

Roughly $600 million of procurement by assisted countries was authorized for minerals and mineral products; of this, the United States was the source of about one-fourth. Mineral products comprised over one-fourth of all ECA commodity-procurement authorizations in the year.

Private Foreign Investment.[11]—Mineral industries continued to lead private direct American investment in foreign countries, accounting for 40 percent of the outstanding total of $13,550 million at the end of

[10] Economic Cooperation Administration, Quarterly Reports to Congress for calendar year 1950.

[11] *See* Survey of Current Business, Private Capital Outflows to Foreign Countries: Vol. 31, No. 12, December 1951, pp. 12–14.

1950. Three-fourths of the mineral equity abroad was in petroleum. The net gain during the year in mineral-industry investment abroad was 11 percent, slightly more than for the total private direct American investment abroad. Three-fifths (or $700 million) of the total new investment (for all industries) was derived from new capital and the remainder from reinvested earnings. The sources of incremental investment funds in mining and smelting were in about the same ratio, but only one-tenth of the increased investment in petroleum was reinvested earnings. Petroleum represented about half of total net new direct foreign investment in 1950 and other mineral inductries about one-tenth.

The Western Hemisphere received 60 percent of the direct mineral investment. New investment in Canada was twice that in Latin America, even though the cumulative total in Canada is only half that in Latin America.

Total mining and petroleum investment abroad in 1950 equaled 20 percent of domestic investment. For petroleum alone the ratio was 27 percent and for other mining 15 percent.

DEFENSE MOBILIZATION

Defense Production Act.—The Defense Production Act of 1950 (Public Law 774, 81st Congress, 2d session, approved September 8, 1950) provided, among other things, for substantial assistance to expand mineral output, for assistance to mineral exploration, for material and equipment allocations, and for price and wage controls. Assistance was made available by means of accelerated tax amortization, Government loans, loan guarantees, advances, and contracts to procure or conditionally procure from expanded output. The assistance was open to American companies with properties either in the United States or abroad. A limit of $2 billion was placed on the gross commitments to be made during the year of the act's life, but this was not intended to limit the programing or negotiation of expansion projects involving far greater commitments.

Defense Minerals Administration.—The Defense Minerals Administration was organized in the United States Department of the Interior under Dr. James Boyd, who also continued as Director of the Bureau of Mines. Work was begun immediately on programs for minerals expansion, as well as on recommendations to the Defense Production Administration for accelerated tax amortization. Several contracts and loans were being negotiated or considered at the end of the year, but the only proposals recommended or certified to the Defense Production Administration during 1950 were the initial primary aluminum expansions by the existing companies for a combined 320,000-ton expansion. Besides being responsible for expanded mineral production, DMA was also made official claimant for scarce materials and equipment for the minerals industries.

Other Agencies.—The Petroleum Administration for Defense and the Defense Solid Fuels Administration were also set up in the Interior Department, with responsibility for petroleum and for coal and coke, respectively. Like DMA, DSFA was headed by a separate Administrator, Charles W. Connor. PAD, on the other hand, was headed by a Deputy Administrator, Bruce K. Brown, with Secretary of

Interior Oscar L. Chapman occupying the Administrator position. The functions of PAD and DSFA were similar to those of DMA.

The National Production Authority in the Commerce Department was also organized upon passage of the Defense Production Act. It had expansion and claimant responsibilities for manufacturing similar to those of DMA for mining, as well as allocation responsibilities for scarce materials. In November and December restrictions (some of them not effective until January 1) were announced on the consumption of steel, copper, aluminum, cobalt, nickel, zinc, and tin.

The line of jurisdiction was formally drawn between NPA and DMA in NPA Delegation 5, December 18, 1950, along the lines of division of industry responsibility between the Bureau of Mines and the Department of Commerce; that is, DMA was to be responsible, so far as expansion and claimant functions were concerned, for the ferrous-metals industry up to but not including blast furnaces, for the nonferrous-metals industry through smelting and refining, and for refractory and other nonmetallic-mineral production through the stage, as a rule, of the primary manufacture. In general, NPA retained the power to allocate refined metals and processed mineral products, while DMA was delegated allocating responsibility for ores and other crude materials.

The Economic Stabilization Agency was also organized under the Defense Production Act, and, near the end of January 1951, froze mineral prices, along with most others, at the highest obtained during the base period of December 19, 1950, through January 25, 1951. Plans were under way, however, for industry advisory committee meetings to consider specific price regulations for various individual commodities. (These meetings, held in January 1951, resulted in most metal prices being frozen at the December 19 level.)

National Strategic Stockpile.—The Emergency Procurement Service of the General Services Administration considerably accelerated its stockpiling operations during 1950. This was due both to revision of the stockpile objectives after Korea to accord with the changed strategic outlook and to considerable expansion in stockpile purchasing authority and in appropriations granted by Congress. Purchase contracts of $831 million were made during the year. The value of stockpile objectives at year end was $8,870 million, an increase of $3,768 million during the year; the value of stockpiles on hand was $2,719 million, $742 million more than a year earlier. However, curtailment of the rate of stockpile acquisition was under consideration at the end of the year because of the current material scarcities.[12]

Molybdenum, magnesium, and fluorspar (both acid and metallurgical grades) were transferred during the year from Stockpile Group II (materials accumulated only from Government surplus) to Group I (materials also purchased on the market). Abrasive-grade bauxite, rutile, iodine, and zirconium ores (baddeleyite and zircon) were transferred from Group I to Group II, and refractory-grade bauxite was added to the stockpiling list (Group I) for the first time. Monazite sand (Group I) was redesignated as "rare earths."

The movement of items from Group I to Group II is equivalent to

[12] Munitions Board, Department of Defense, Stockpile Report to the Congress: July 23, 1950, and January 23, 1951.

elimination of the objectives for those items and hence of the need to purchase; quantities already in the stockpile are retained, however.

The Bureau of Mines continued its efforts to improve the availability of stockpiled materials, with particular progress for the following: Aluminum and bauxite, antimony, asbestos, beryllium, chromite, cobalt, copper, kyanite, lead, zinc, cadmium, magnesium, manganese, mica, monazite, talc, tin, titanium, and tungsten.

TECHNOLOGY [13]

Mining.—Technologic developments in mineral mining in 1950 largely involved adoption of new equipment and new practices, with few noteworthy shifts in mining methods.[14]

Unusually large caving blocks were laid out in the Canadian asbestos mines, and introduction of block caving into the Lake Superior iron district brought this mining method back to the country of its beginnings. Sand filling of stopes was tested and techniques were perfected at a number of mines. A novel and interesting mining method reported during the year was that employed by the Round Mountain Gold Dredging Corp. in Nevada where, starting in January 1950, a large alluvial gold deposit was mined by "dry-land" methods.[15]

Roof bolting gained further acceptance in both metal and nonmetal mines, while steel and concrete supports were adopted in some mines as a means of holding openings in heavy ground.

In the equipment field, drilling economy as usual was the chief objective, with particular interest in competing types of drill bits. The carbide insert bit gained increased acceptance, but the multi-use and single-use (throw-away) detachable bit, the diamond drill, and even the conventional forged-steel bit appeared still to have uses from which they would not be displaced. Light drills on jackleg mountings were adopted at a number of mines, while at others mobile drill jumbos were installed. Millisecond-delay electric blasting caps were used experimentally in many mines, and results appeared to be definitely advantageous, particularly in stoping.

Diesel power was introduced underground more widely, not only for locomotives but for bulldozers, compressors, and other powered equipment. Mucking machines—track-mounted, rubber-tired, or with crawlers—and a variety of trackless transport equipment made further advances for loading and hauling.

Milling and Metallurgy.—Beneficiation of metallic and nonmetallic minerals continued to be improved. Great strides have been made in applying the Driessen cone, also known as the Dutch cyclone, in dewatering concentrates and fine coal and, if fed with a dense medium for separating granular heavy minerals from gangue, as a substitute for the use of tables. The Humphrey spiral concentrator has been increasingly used in the heavy sands of Florida for recovering ilmenite, rutile, leucoxene, zircon, monazite, and staurolite from sea sands and

[13] The sections on mining, milling and metallurgy, and fuels were prepared, respectively, by Charles H. Johnson, chief, Base Metals Branch; Oliver C. Ralston, chief metallurgist; and Arno C. Fieldner, chief fuels technologist.

[14] Hubbell, A. H., Survey of Mining Practice: Eng. and Min. Jour., vol. 152, No. 2, pp. 108–115, and No. 3, 1951, pp. 80–83.
Mining Engineering, Annual Review, Metal Mining: Vol. 190, No. 2, 1951, pp. 118–121.
Clarke, V. H., Metal-Mining Practice: Min. Cong. Jour., vol. 37, No. 2, 1951, pp. 40–42.

[15] Huttl, J. B., New 17,000-Ton Dry-Land Dredge: Eng. and Min. Jour., vol. 151, No. 6, June 1950, pp. 68–70.

granular phosphate from the pebble phosphate area. Spirals are also used in the Adirondacks for recovering ilmenite. They can be installed in a small fraction of the space required for gravity-concentrating tables. Spirals also successfully treated flake mica from weathered material in the South; in this case the mica acts like the lightest specific gravity mineral present, due to its shape.

Beneficiation of the taconite ores continued at an accelerated pace. The problem of agglomerating fine iron-ore concentrate into particles suitable for blast-furnace feed has been acute. Briquetting, sintering, and pelletizing have been investigated and compared. Pelletizing involves processing flotation concentrates with the proper amount of moisture so that they can be rolled into water-bound spherules that can be indurated by heating to the proper temperature to mature the colloidal fraction into a permanent binder.

The Dorr fluosolids reactor, originally installed commercially for burning powdered limestone, is being tested for roasting and heat-treating a wide variety of powdered mineral products. The apparatus is capable of close control of temperature and close control of gas analysis in the hot gases supplied to or taken from the reactor. Better sulfate and chloridizing roasting is anticipated. Stronger SO_2 gas from the roasting of pyrite or pyrrhotite flotation concentrate is another possibility.

Mineral beneficiators are continually improving crushing and grinding techniques and apparatus. Every year new forms of apparatus are developed for dense-medium concentration of coarse and sand sizes of minerals.

Vacuum methods of reducing metals and melting them are finding more applications for treating titanium, zirconium, molybdenum, and other metals that are sensitive to ordinary furnace atmospheres. Magnesium was the metal that brought about rapid improvement in vacuum techniques during World War II, and suitable equipment is now easily acquired.

Fuels.—Development work on synthetic liquid fuels from coal and oil shale continued to occupy the greater part of the Bureau of Mines fuels research program; important progress was also made in determining the minable reserves of coking coal. Experimental research on coking coals has shown that many low-grade deposits can be upgraded by washing to remove sulfur and ash and that large reserves of weakly coking coals can be utilized by blending them with strongly coking coals for making metallurgical coke. Other research developed a new method for rapidly drying small sizes of lignite and noncoking coals in a fluidized or entrained state. The Bureau's research work on coal in 1950 is summarized in Information Circulars 7618 and 7647.[16]

Bureau of Mines Publications.—Among the more important Bureau of Mines publications of a theoretical nature released during the year were those dealing with: Theoretical metallurgy (p. 3, B 477),[17] generation and propagation of strain waves in rock (p. 13, RI 4683), vibrations in an elastic medium (p. 14, RI 4692), and evaporation of zinc (p. 15, RI 4710). Especially useful summaries of certain of the

[16] Fieldner, A. C., and Gottley, Sidney, Annual Report of Research and Technologic Work on Coal, Fiscal Year 1950: Bureau of Mines Inf. Circ. 7618, 1951, 80 pp.
Brown, R. L., and Carman, E. P., Annual Report of Research and Technologic Work on Coal, Fiscal Year 1951: Bureau of Mines Inf. Cir. 7647, 1952, 81 pp.

[17] Page references are to Supplement to List of Publications, Bureau of Mines, January 1 to December 31, 1950. B indicates Bulletin, RI Report of Investigations, and IC Information Circular.

Bureau's continuing investigations were also released—strategic-mineral development (p. 10, RI 4647), synthetic liquid fuels (p. 11, RI 4651, 4652, 4653, 4654), and explosives (p. 12, RI 4667). Publications of unusual interest on safety measures included those on: Dust (p. 3, B 478), coal-mine fires (p. 13, RI 4686), and permissible explosives (p. 11, RI 4663). Economic studies of interest covered core-drilling costs (p. 9, RI 4628) and energy uses and supplies (p. 23, IC 7582). Mining and development publications included, among others, papers on magnetic surveys (p. 8, RI 4586), treated timbers (p. 8, RI 4622), jumbo drilling (p. 9, RI 4625), Diesel underground haulage (p. 10, RI 4643), secondary recovery of oil (p. 14, RI 4690), explosive shooting of wells (p. 16, RI 4714), carbide insert bits (p. 21, IC 7558), and truck haulage (p. 23, IC 7584).

Metallurgical studies were made of many metals, including lead, titaniferous ores, zirconium alloys, zinc, ilmenite, and chromium. The most numerous investigations of mineral deposits were made on tungsten and manganese ores and on coal. Numerous analyses were published of properties of coals and crude oils from various sources.

WORLD REVIEW

Production.—Increased economic activity in most of the industrial countries of the world, plus the rush for raw materials occasioned by the outbreak of hostilities in Korea, affected world, as well as United States, production of minerals. The output of most minerals in 1950 was well above 1949 and in numerous cases reached new highs.

Crude petroleum, with an increase of about 10 percent from the preceding year, was one of the commodities whose world output broke all previous records. Although United States production (over half of the world total) was slightly under the 1948 peak, other important producers of crude oil—such as Venezuela, Iran, and Saudi Arabia—more than made up the difference.

World coal production, while substantially higher than in 1949, did not quite regain earlier losses. The three leading producers—the United States, the United Kingdom, and Germany—all increased output, but the United States failed to match its World War II record, and neither the United Kingdom nor Germany reattained prewar production levels.

Natural gas, like petroleum, reached a new production peak, with the United States, by far the largest producer, contributing most of the increase. Italy, a relative newcomer in large-scale use of natural gas, more than doubled its 1949 production. Venezuela, the world's second-largest producer, also established a new peak, as did Canada and Mexico, third and fourth largest producers (except possibly for the U. S. S. R.), respectively.

An increase of about 15 percent in world industrial activity over that in 1949 [18] was reflected in an increase of similar magnitude in world steel production but a smaller increase (about 10 percent) in iron-ore output. This was enough to establish a new record for world production of iron ore, although the United States, which produces about half the world supply, did not quite regain World War II peaks. World mine production of manganese, chrome, molybdenum, and

[18] Statistical Office of the United Nations, Statistical Yearbook 1951, New York, 1951, p. 120.

tungsten apparently also increased (data are not available for the U. S. S. R.), but only in the case of chrome ore was there an apparent new record.

In response to price increases during the year ranging from 33 percent (electrolytic copper, New York) to 117 percent (tin, London), world mine production of all principal nonferrous metals increased over 1949 but in no case reached World War II records. Despite the price rise, the smallest relative gain was in world production of tin.

Reflecting sustained construction activity all over the world, output of cement reached a level about 15 percent higher than in 1949 and half again as high as either prewar or the peak of World War II. World sulfur production, over 90 percent of which was supplied by the United States, also reached a new high, more than double prewar. Production of fertilizer materials—potash, phosphate rock, and nitrogen (including synthetic)—similarly rose well above any previous high.

Detailed statistics on world production of mineral commodities in 1950 will be found at the end of this volume.

Intergovernmental Action.—In the early part of 1950 proposals for intergovernmental action in the commodity field were concerned mainly with actual or expected surpluses; after hostilities broke out in Korea, concern shifted rapidly to actual or prospective shortages.

The early concern over surpluses was concentrated mainly on agricultural commodities but also included a mineral commodity—tin. Pressure to reach a commodity agreement for tin resulted in a Draft International Agreement (the so-called "Paris draft") at the fifth meeting of the International Tin Study Group in March 1950. The draft contained proposals for controlling exports and creating a buffer stock. The Study Group also adopted a resolution calling upon the Secretary General of the United Nations to convene a United Nations conference to discuss an international control agreement. After consideration of the resolution by the Interim Coordinating Committee for International Commodity Arrangements, such a Tin Conference met in Geneva in October, attended by delegates from the principal producing and consuming countries, but adjourned a month later to permit further study of the various control plans offered.[19]

Concern over raw-material shortages and soaring prices was expressed both at the meeting of the Deputies of the North Atlantic Treaty Council in London in July and at a meeting of the Foreign Ministers of France, the United Kingdom, and the United States in New York City in September. In October the Council of the Organization for European Economic Cooperation (Marshall Plan countries) initiated a study of raw-material shortages and methods for dealing with them and on December 1 came to the conclusion that any plan of action, to be successful, must be participated in not only by OEEC countries, but also by Canada and the United States. The problem was also recognized by the United Nations General Assembly in its fall meeting and by the Council of the Organization of American States in December.

Meanwhile, conversations took place directly among representatives of some of the more important raw-material-consuming countries. The "Statement of Principles for Economic Cooperation" which was

---

[19] Interim Coordinating Committee for International Commodity Arrangements, Review of International Commodity Problems, 1950: United Nations, January 1951, pp. 5-6.

adopted in an exchange of notes between the United States and Canada in October 1950 provided, among other things, for developing a coordinated program of requirements, production, and procurement and for instituting coordinated controls over the distribution of scarce raw materials and supplies. Conversations early in December between Prime Minister Attlee of the United Kingdom and the President of the United States resulted in agreement that

> * * * While defense production must be given the highest practicable priority in the case of raw materials whose supply is inadequate, the essential civilian requirements of the free countries must be met so far as practicable. In order to obtain the necessary materials and to devote them as rapidly as possible to these priority purposes, we have agreed to work closely together for the purpose of increasing supplies of raw materials. We have recognized the necessity of international action to assure that basic raw materials are distributed equitably in accordance with defense and essential civilian needs. * * *

This declaration was the forerunner of the International Materials Conference.[20]

[20] International Materials Conference, Report on Operations, February 26, 1951–March 1, 1952: Washington, D. C., pp. 6–9.

Statistical Summary of Mineral Production

By K. Joyce D'Amico

GENERAL SUMMARY

THE TABLES in this chapter summarize the statistics on mineral production in the United States, each of the individual States, and the Territories, possessions, and other areas administered by the United States. Most of the tables, as noted in each case, deal with the area known as continental United States—the 48 States and the District of Columbia.

Mineral production may be measured at any of several stages of extraction and processing. The stage of measurement used in this chapter is, generally speaking, what is termed "mine output." This usually refers to minerals in the form in which they are first extracted from the ground, but customarily includes, for some minerals, the product of auxiliary processing operations carried on at or near mines—such as sizing and cleaning, in the case of coal, and concentrating, in the case of metallic ores.

Because of inadequacies in the available statistics, some of the series herein deviate from the foregoing definition. In particular, the limestone, cement rock, and clay that are processed into cement are measured as the latter rather than in their originally extracted form; similarly, limestone used for lime is measured as the latter rather than the former. Natural-gas liquids are measured in the form in which they leave the natural gasoline or cycle plants. The quantities of gold, silver, copper, lead, zinc, and tin are recorded on a mine basis—that is, as the recoverable content of ores sold or treated; the values assigned, however, are based on the average selling price of refined metal. Mercury is measured in the form of recovered metal and valued at the average New York price for metal.

A number of additional deficiencies in the previously existing series for value of mineral production were eliminated with revisions that are described in the Statistical Summary chapter of Minerals Yearbook 1949. The revised value series originally shown there for 1947–49 only has now been carried back to 1925 and is shown, along with the old series dating back to 1880, in table 1 herein. Tables

2 and 6 show quantities and values on the new basis for individual minerals, both for the United States and for individual States, for 1947–50. Table 5 gives totals on the new basis for the individual States for each of the years 1925–46.

The weight or volume units shown are those customary in the particular industries producing the respective products. No adjustment has been made in the dollar values for changes in purchasing power of the dollar.

TABLE 1.—Value of mineral production in the United States, 1880–1948 (old basis) and 1925–50 (new basis)

[Millions of dollars]

Year	Nonmetallic			Metallic	Grand total	Year	Nonmetallic			Metallic	Grand total
	Fuels	Other	Total				Fuels	Other	Total		
OLD BASIS											
1880	120	56	176	191	367	1933	1,683	455	2,138	417	2,555
1885	183	62	245	175	420	1934	2,233	543	2,776	549	3,325
1890	231	80	311	304	615	1935	2,330	587	2,917	733	3,650
1895	268	126	394	249	643	1936	2,759	716	3,475	1,082	4,557
1900	407	188	595	514	1,109	1937	3,200	745	3,945	1,468	5,413
1905	602	319	921	703	1,624	1938	2,820	650	3,470	893	4,363
1910	828	410	1,238	750	1,988	1939	2,834	788	3,622	1,292	4,914
1915	972	429	1,401	994	2,395	1940	3,116	819	3,935	1,679	5,614
1920	4,193	1,024	5,217	1,764	6,981	1941	3,708	1,038	4,746	2,132	6,878
1925	3,059	1,237	4,296	1,382	5,678	1942	4,103	1,109	5,212	2,364	7,576
1926	3,542	1,266	4,808	1,406	6,214	1943	4,608	976	5,584	2,488	8,072
1927	3,060	1,249	4,309	1,221	5,530	1944	5,178	899	6,077	2,340	8,417
1928	2,885	1,212	4,097	1,288	5,385	1945	5,212	954	6,166	1,975	8,141
1929	3,190	1,217	4,407	1,481	5,888	1946	5,760	1,311	7,071	1,825	8,896
1930	2,764	1,015	3,779	986	4,765	1947	7,941	1,634	9,575	2,909	12,484
1931	1,892	705	2,597	570	3,167	1948	10,362	1,894	12,256	3,510	15,766
1932	1,743	433	2,176	286	2,462						
NEW BASIS [1]											
1925	2,905	1,192	4,097	715	4,812	1938	2,433	625	3,058	460	3,518
1926	3,366	1,224	4,590	721	5,311	1939	2,420	757	3,177	631	3,808
1927	2,869	1,207	4,076	622	4,698	1940	2,659	787	3,446	752	4,198
1928	2,660	1,169	3,829	655	4,484	1941	3,224	993	4,217	890	5,107
1929	2,934	1,172	4,106	802	4,908	1942	3,563	1,061	4,624	999	5,623
1930	2,495	978	3,473	507	3,980	1943	4,023	921	4,944	987	5,931
1931	1,617	674	2,291	287	2,578	1944	4,568	842	5,410	900	6,310
1932	1,457	415	1,872	128	2,000	1945	4,563	894	5,457	774	6,231
1933	1,411	434	1,845	205	2,050	1946	5,084	1,249	6,333	729	7,062
1934	1,944	523	2,467	277	2,744	1947	7,181	1,345	8,526	1,084	9,610
1935	2,011	566	2,577	365	2,942	1948	9,495	1,559	11,054	1,219	12,273
1936	2,401	689	3,090	516	3,606	1949	7,912	1,567	9,479	1,101	10,580
1937	2,795	714	3,509	756	4,265	1950	8,681	1,823	10,504	1,351	11,855

[1] *See* text. Data for 1925–46 are not strictly comparable with those for 1947–50, since for the earlier years the value of heavy clay products has not been replaced by the value of raw clays used in such products. Refers to continental United States only. For data for 1947–50 on Territories, possessions, and other areas administered by the United States, *see* tables 7 and 8.

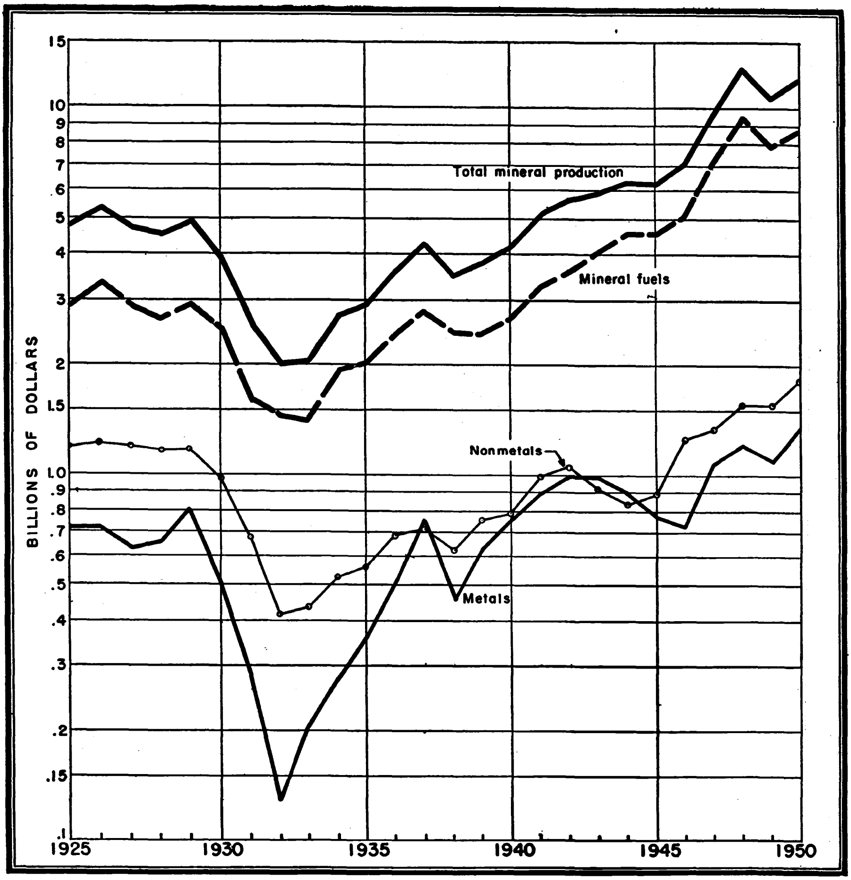

FIGURE 1.—Value of mineral production in continental United States, 1925-50.

TABLE 2.—Mineral production in continental United States, 1947–50, by individual minerals [1]

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
MINERAL FUELS								
Coal:								
Bituminous [2] ... thousand short tons	627,389	2,614,561	596,024	2,983,465	434,342	2,126,226	[3] 512,529	[3] 2,489,229
Lignite ... do	2,874	5,519	3,086	7,012	3,092	7,336	[3] 3,370	[3] 8,112
Pennsylvania anthracite ... do	57,190	413,019	57,140	467,052	42,702	358,008	44,077	392,398
Natural gas ... million cubic feet	4,582,173	274,709	5,148,020	333,173	[4] 5,419,736	[4] 344,034	[3] 6,282,060	[3] 408,521
Natural-gas liquids:								
Natural gasoline and cycle products ... thousands of 42-gallon barrels	87,130	228,174	94,124	341,154	[4] 99,217	[4] 303,136	[3] 109,679	[3] 321,832
LP-gases ... do	45,043	66,820	52,597	117,823	[4] 57,869	[4] 99,054	[3] 72,282	[3] 97,773
Petroleum (crude) ... do	1,856,987	3,577,890	2,020,185	5,245,080	[4] 1,841,940	[4] 4,674,770	[3] 1,973,574	[3] 4,963,380
Total mineral fuels	...	7,181,000	...	9,495,000	...	[4] 7,912,000	...	8,681,000
NONMETALLIC MINERALS (EXCEPT FUELS)								
Abrasive stone: [5]								
Grindstones and pulpstones ... short tons	10,696	482	7,954	405	4,507	247	4,468	233
Millstones	(6)	23	(6)	18	(6)	9	(6)	11
Pebbles (grinding) ... short tons	5,860	123	4,026	102	2,374	64	1,923	53
Tube-mill liners (natural) ... do	1,496	40	1,297	42	1,166	47	1,523	63
Asbestos ... do	24,035	919	37,092	1,806	43,387	2,614	42,434	2,925
Asphalt and related bitumens (native):								
Bituminous limestone and sandstone ... do	1,004,740	3,756	1,084,004	3,635	1,150,931	4,265	1,184,676	3,522
Gilsonite ... do	67,165	1,746	52,122	1,391	51,462	1,304	66,186	1,774
Wurtzilite ... do	17	1	...	...	...	...	...	...
Barite (crude) ... do	834,082	6,171	799,848	6,693	717,313	5,642	695,414	6,194
Boron minerals ... do	501,935	11,844	450,932	11,148	467,592	11,512	647,735	15,890
Bromine ... thousand pounds	78,178	14,837	76,048	14,825	88,726	16,268	98,502	18,795
Calcium-magnesium chloride ... short tons, 75-percent (Ca, Mg) Cl_2 basis	271,206	2,650	309,660	3,907	255,797	3,261	299,821	3,802
Carbon dioxide, natural (estimated) ... thousand cubic feet	581,000	412	545,000	397	489,000	376	472,334	369
Cement ... thousands of 376-pound barrels	188,516	356,639	205,239	446,465	207,142	475,074	228,788	537,652
Clays (including fuller's earth) [7] ... thousand short tons	28,192	71,250	31,304	80,997	28,474	74,619	32,301	89,676
Emery ... short tons	5,798	67	5,405	69	4,909	61	5,949	75
Feldspar (crude) ... long tons	459,910	2,411	460,713	2,564	369,378	2,278	407,925	2,558
Fluorspar ... short tons	329,484	10,955	331,749	11,227	236,704	8,267	301,510	10,620
Garnet (abrasive) ... do	8,722	614	8,039	588	6,578	505	9,304	794
Gem stones (estimated)	(6)	540	(6)	450	(6)	450	(6)	450
Graphite ... short tons	5,207	221	9,871	451	5,213	475	5,605	428
Gypsum (crude) ... do	6,208,216	16,530	7,254,535	19,113	6,608,118	18,319	8,192,625	22,735
Helium (shipments, calendar years) ... thousand cubic feet	52,322	501	50,915	610	51,501	689	80,889	1,028
Kyanite ... short tons	(8)	(8)	14,552	527	12,115	403	(8)	(8)
Lime (open-market) ... do	6,759,949	63,363	7,245,211	74,677	6,302,551	68,908	7,462,109	82,847

Lithium minerals do	2,441	151	3,881	211	4,838	346	9,306	580
Magnesite (crude) do	375,993	2,597	[8]	[8]	287,315	1,950	429,392	3,091
Magnesium compounds from sea water and brines (except for metal) short tons, MgO equivalent	89,500	5,840	91,700	6,918	63,000	5,033	89,300	7,283
Marl:								
Calcareous (except for cement) short tons	176,187	235	114,759	146	166,800	232	347,843	246
Greensand do	8,337	433	7,269	393	6,128	277	3,935	304
Mica:								
Scrap do	49,797	1,096	52,157	1,092	32,856	796	69,360	1,743
Sheet pounds	415,589	116	270,042	46	513,994	132	578,818	126
Olivine short tons	10,838	129	4,766	86	3,528	57	4,577	64
Peat do	136,232	869	129,581	930	129,532	1,020	130,723	1,143
Perlite do	10,495	58	22,112	134	71,203	511	101,536	649
Phosphate rock thousand long tons	9,027	46,639	8,669	50,502	8,987	51,415	10,254	59,028
Potassium salts short tons, K_2O equivalent	1,053,266	34,716	1,143,339	35,999	1,120,653	35,106	1,275,494	39,695
Pumice and pumicite short tons	442,552	2,022	607,646	2,501	716,742	2,369	719,356	2,661
Pyrites long tons	940,652	4,070	928,531	3,950	888,388	3,904	931,163	4,059
Quartz from pegmatites and quartzite short tons	101,317	425	161,861	751	107,552	475	160,508	707
Salt (common) thousand short tons	16,041	52,090	16,388	54,220	[4] 15,560	[4] 53,549	16,616	59,774
Sand and gravel do	283,189	212,568	318,070	252,244	315,895	245,661	367,304	292,559
Sand and sandstone (ground) short tons	644,508	5,154	692,773	5,778	610,789	5,258	750,673	6,463
Slate do	876,010	11,686	799,400	12,881	740,260	12,164	930,370	15,047
Sodium carbonate (natural) do	293,051	5,862	[9] 288,769	[9] 6,623	[9] 200,496	[9] 4,164	351,075	7,544
Sodium sulfate (natural) do	257,294	3,329	265,862	4,249	186,223	2,734	186,537	2,199
Stone [10] thousand short tons	206,242	286,792	224,475	326,660	222,549	339,442	250,844	387,911
Sulfur:								
Ore for direct agricultural use long tons	4,303	65	1,700	30	5,392	102	3,247	60
Frasch-process do	4,828,103	85,200	4,978,912	89,600	4,789,311	86,208	5,504,714	104,000
Talc, pyrophyllite, and ground soapstone short tons	516,094	7,682	518,746	8,265	461,896	7,523	620,750	10,621
Topaz (industrial) do	2,294	46	200	4	[8]	[8]	-----	-----
Tripoli do	34,578	751	26,845	706	25,525	691	43,720	1,174
Vermiculite do	131,385	1,339	138,635	1,387	168,819	1,686	208,096	2,122
Wollastonite do	80	2	75	2	500	7	800	16
Undistributed: Andalusite (1947–49), aplite, brucite, diatomite, dumortierite **(1949), epsom salts from serpentine** (1947), and epsomite (1949–50), iodine, **quartz crystal (1950), sharpening stones,** sodium carbonate (Wyoming 1948–49), **and minerals whose value** must be concealed for particular years (indicated **in appropriate column by** footnote reference 8)	-----	7,305	-----	10,549	-----	8,105	-----	9,824
Total nonmetallic minerals (except fuels)	-----	1,345,000	-----	1,559,000	-----	1,567,000	-----	1,823,000
METALS								
Antimony ore and concentrate short tons, gross weight	19,980	3,256	16,171	4,349	5,186	1,134	6,888	1,443
Bauxite long tons, dried equivalent	1,202,055	6,885	1,457,148	8,697	1,148,792	6,778	1,334,527	7,693
Beryllium concentrate short tons, gross weight	145	25	99	27	346	111	559	171
Chromite do	948	[11]	3,619	[11]	433	12	404	[11]
Cobalt (content of ore) pounds	676,612	[11]	580,703	[11]	673,773	[11]	660,025	[11]
Columbium (niobium) concentrate pounds, gross weight	-----	-----	100	[11]	-----	-----	[11]	[11]
Copper (recoverable content of ores, etc.) short tons	847,551	355,971	834,797	362,302	752,746	296,582	909,337	378,284
Gold (recoverable content of ores, etc.) troy ounces	1,829,197	64,022	1,765,862	61,805	1,762,367	61,683	2,104,959	73,674

For footnotes, see end of table.

TABLE 2.—Mineral production in continental United States, 1947–50 by individual minerals [1]—Continued

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
METALS—continued								
Iron ore, usable (excluding byproduct iron sinter) thousand long tons, gross weight	92,670	317,629	100,275	391,230	84,174	377,637	97,151	483,358
Lead (recoverable content of ores, etc.) short tons	383,957	110,580	390,147	139,673	409,857	129,515	430,678	116,283
Manganese ore (35 percent or more Mn) short tons, gross weight	131,627	4,201	131,100	4,390	126,135	5,179	134,451	6,230
Manganiferous ore (5 to 35 percent Mn) do	1,174,355	3,447	1,340,565	(11)	1,078,395	4,040	1,087,597	4,609
Manganiferous residuum do	227,547	(11)	291,383	(11)	158,902	(11)	183,842	(11)
Mercury 76-pound flasks	23,117	1,936	14,288	1,093	9,830	781	4,535	368
Molybdenum (content of ore and concentrate) thousand pounds	22,190	15,178	29,669	20,418	23,280	19,332	44,544	37,729
Platinum-group metals (crude) troy ounces	324	(11)	(11)	(11)	(11)	(11)	(11)	(11)
Silver (recoverable content of ores, etc.) thousand troy ounces	35,757	32,360	38,029	34,418	34,639	31,350	42,406	38,380
Tantalum concentrate pounds, gross weight	3,259	9	500	(11)	----------	----------	(11)	(11)
Tin (content of ore and concentrate) long tons	----------	----------	(12)	(11)	17	37	15	31
Titanium concentrate:								
Ilmenite short tons, gross weight	336,061	5,029	381,508	5,794	389,234	6,212	468,320	5,607
Rutile do	5,157	534	9,907	647	10,559	490	(11)	(11)
Tungsten concentrate short tons, 60-percent WO_3 basis	3,081	4,336	4,033	6,355	2,765	4,377	4,807	8,157
Vanadium (content of ore and concentrate) pounds	2,117,962	1,285	(11)	(11)	(11)	(11)	(11)	(11)
Zinc (recoverable content of ores, etc.) short tons	637,583	153,112	629,955	167,974	593,201	148,913	623,369	178,667
Undistributed: Magnesium chloride for magnesium metal, zirconium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 11)	----------	3,876	----------	10,466	----------	6,671	----------	10,217
Total metals	----------	1,084,000	----------	1,219,000	----------	1,101,000	----------	1,351,000
Grand total mineral production	----------	9,610,000	----------	12,273,000	----------	[4]10,580,000	----------	11,855,000

[1] Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels and the following additional minerals are strictly production: Gypsum, iodine, magnesite, pyrites, antimony, bauxite, and mercury. Excludes uranium ores and monazite.
[2] Includes small quantity of anthracite mined in States other than Pennsylvania.
[3] Final figure. Supersedes preliminary figure given in commodity chapter.
[4] Revised figure.
[5] Excludes sharpening stones, which are included with "Nonmetallic minerals, undistributed."
[6] Weight not recorded.
[7] Excludes clays sold or used for cement as follows: 1947—5,336,000 short tons, $2,987,000; 1948—6,362,000 tons, $4,320,000; 1949—6,676,000 tons, $4,573,000; 1950—7,080,000 tons, $5,574,000.
[8] Value included with "Nonmetallic minerals, undistributed."
[9] Excludes production from Wyoming, value for which is included with "Nonmetallic minerals, undistributed."
[10] Excludes abrasive stone, bituminous limestone, bituminous sandstone, and ground soapstone, all included elsewhere in table. Also excludes limestone for cement and lime.
[11] Value included with "Metals, undistributed."
[12] Less than 0.5 ton.

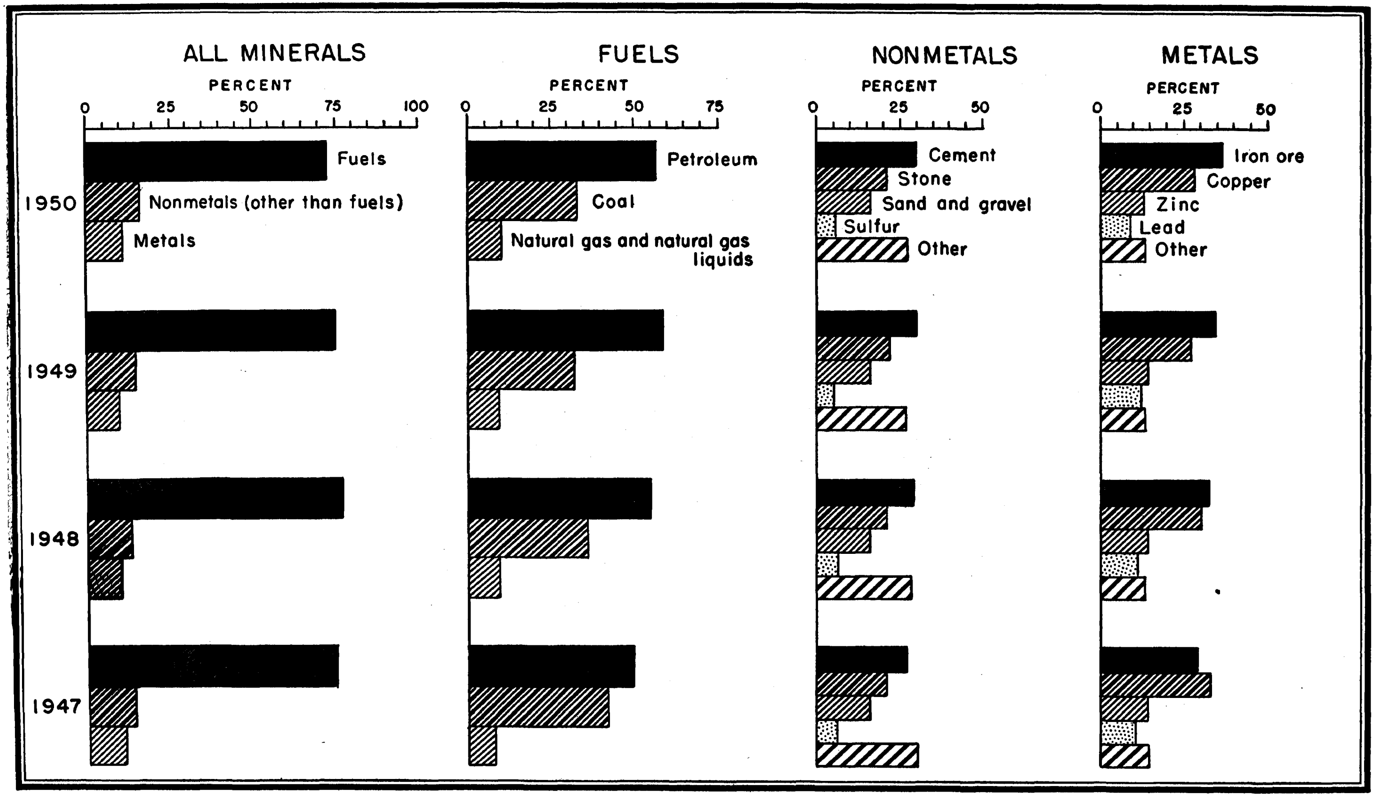

Figure 2.—Value of mineral production in continental United States, 1947–50, by mineral group and by minerals, in percent.

TABLE 3.—**Minerals produced in continental United States and principal producing States in 1950**

Rank in value	Mineral	Principal producing States: In order of quantity	Principal producing States: In order of value
	Abrasive stone:		
70	Grindstones and pulpstones	Ohio, West Virginia, Washington	Rank same as for quantity.
81	Millstones	Not available	North Carolina, Virginia.
77	Pebbles (grinding)	Minnesota, Wisconsin, Texas, Washington	Minnesota, Wisconsin, Texas, North Carolina.
76	Sharpening stones	Arkansas, Indiana, Ohio, New Hampshire	Arkansas, New Hampshire, Indiana, Ohio.
74	Tube-mill liners (natural)	Minnesota, North Carolina, Wisconsin	Rank same as for quantity.
49	Antimony ores and concentrates	Idaho, Nevada	Do.
63	Aplite	Virginia	Do.
42	Asbestos	Vermont, Arizona, North Carolina, Oregon	Do.
36	Asphalt (native)	Texas, Alabama, Oklahoma, Utah	Utah, Texas, Alabama, Kentucky.
34	Barite (crude)	Arkansas, Missouri, Georgia, Nevada	Do.
28	Bauxite	Arkansas, Georgia, Alabama	Arkansas, Alabama, Georgia.
71	Beryllium concentrates	New Mexico, New Hampshire, Colorado, South Dakota	Rank same as for quantity.
23	Boron minerals	California	Do.
22	Bromine	Texas, Michigan, California, West Virginia	Michigan, Texas, California, West Virginia.
66	Brucite	Nevada	Rank same as for quantity.
39	Calcium-magnesium chloride	Michigan, West Virginia, California, Ohio	Michigan, California, West Virginia, Ohio.
64	Carbon dioxide (natural)	California, Utah, New Mexico, Oregon	California, Oregon, Washington, Utah.
3	Cement	Pennsylvania, California, Texas, New York	Rank same as for quantity.
82	Chromite	California	Do.
13	Clays	Ohio, Pennsylvania, Georgia, Illinois	Georgia, Ohio, Pennsylvania, South Carolina.
2	Coal:		
	Bituminous	West Virginia, Pennsylvania, Kentucky, Illinois	Rank same as for quantity.
	Lignite	North Dakota, Montana, South Dakota, Texas	Do.
	Pennsylvania anthracite	Pennsylvania	Do.
62	Cobalt (in ores, etc.)	do	Do.
8	Copper	Arizona, Utah, New Mexico, Montana	Do.
31	Diatomite	California, Nevada, Oregon, Washington	Do.
72	Emery	New York	Do.
84	Epsomite	Washington	Do.
44	Feldspar (crude)	North Carolina, Colorado, South Dakota, New Hampshire	North Carolina, New Hampshire, Colorado, South Dakota.
26	Fluorspar	Illinois, Kentucky, New Mexico, Utah	Illinois, Kentucky, New Mexico, Colorado.
54	Garnet (abrasive)	New York, Idaho	Rank same as for quantity.
60	Gem stones	Not available	Oregon, California, Texas, Washington.

15	Gold (in ores, etc.)	South Dakota, Utah, California, Nevada	Rank same as for quantity
61	Graphite:		
	Amorphous	Rhode Island	Do.
	Crystalline	Texas, Alabama	Do.
21	Gypsum (crude)	Michigan, New York, Texas, Iowa	Do.
53	Helium	Texas	Do.
50	Iodine	California	Do.
4	Iron ore (usable)	Minnesota, Michigan, Alabama, Utah	Minnesota, Michigan, Alabama, New York.
57	Kyanite	Virginia, South Carolina	Rank same as for quantity.
11	Lead (in ores, etc.)	Missouri, Idaho, Utah, Colorado	Do.
14	Lime (open-market)	Ohio, Pennsylvania, Missouri, Virginia	Ohio, Pennsylvania, Missouri, Illinois.
59	Lithium minerals	South Dakota, California, New Mexico, Maine	California, South Dakota, New Mexico, Maine.
41	Magnesite (crude)	Washington, Nevada, California	Rank same as for quantity.
40	Magnesium chloride (for magnesium metal)	Texas	Do.
30	Magnesium compounds from sea water and brines (except for metal).	California, Michigan, New Jersey	Michigan, California, New Jersey.
33	Manganese ore	Montana, New Mexico, Arkansas, Arizona	Rank same as for quantity.
37	Manganiferous ore	Minnesota, Michigan, New Mexico, Nevada	Do.
48	Manganiferous residuum	New Jersey	Do.
	Marl:		
69	Calcareous	Michigan, Virginia, Wisconsin, Indiana	Michigan, Virginia, Nevada, Indiana.
68	Greensand	New Jersey	Rank same as for quantity.
65	Mercury	California, Nevada, Oregon	Do.
47	Mica	North Carolina, Georgia, Arizona, South Dakota	North Carolina, Georgia, Arizona, Pennsylvania.
	Scrap	do	Do.
	Sheet	North Carolina, Georgia, New Hampshire, South Dakota	North Carolina, New Hampshire, Georgia, South Dakota.
20	Molybdenum (in ores and concentrates)	Colorado, Utah, New Mexico, Arizona	Rank same as for quantity.
6	Natural gas	Texas, Louisiana, California, Oklahoma	Texas, California, Louisiana, West Virginia.
5	Natural-gas liquids:		
	Natural gasoline and cycle products	Texas, California, Louisiana, Oklahoma	Rank same as for quantity.
	LP-gases	Texas, California, Oklahoma, Louisiana	Do.
73	Olivine	North Carolina, Washington	Do.
52	Peat	New Jersey, Florida, Ohio, Michigan	Ohio, New Jersey, Michigan, Florida.
58	Perlite (crude)	Nevada, New Mexico, Oregon, Colorado	Nevada, New Mexico, Colorado, Oregon.
1	Petroleum (crude)	Texas, California, Louisiana, Oklahoma	Rank same as for quantity.
17	Phosphate rock	Florida, Tennessee, Idaho, Montana	Florida, Tennessee, Montana, Idaho.
79	Platinum-group metals (crude)	California	Rank same as for quantity.
18	Potassium salts	New Mexico, California, Utah, Michigan	Do.
43	Pumice and pumicite	New Mexico, California, Idaho, Oregon	New Mexico, California, Oregon, Idaho.
38	Pyrites	Tennessee, Virginia, Montana, California	Tennessee, Virginia, California, Montana.
83	Quartz crystal	Utah	Rank same as for quantity.
55	Quartz from pegmatites and quartzite	Washington, North Carolina, Connecticut, California	Washington, Connecticut, North Carolina, California.
16	Salt (common)	Michigan, New York, Ohio, Louisiana	Michigan, New York, Louisiana, Kansas.
9	Sand and gravel	California, Michigan, New York, Wisconsin	California, New York, Pennsylvania, Michigan.
32	Sand and sandstone (ground)	Illinois, New Jersey, West Virginia, Ohio	Illinois, West Virginia, New Jersey, Ohio.
19	Silver (in ores, etc.)	Idaho, Utah, Montana, Arizona	Rank same as for quantity

TABLE 3.—Minerals produced in continental United States and principal producing States in 1950—Continued

Rank in value	Mineral	Principal producing States: In order of quantity	Principal producing States: In order of value
24	Slate	Pennsylvania, Vermont, New York, Georgia	Pennsylvania, Vermont, New York, Virginia.
29	Sodium carbonate (natural)	California, Wyoming	Rank same as for quantity.
45	Sodium sulfate (natural)	California, Texas, Wyoming	Do.
7	Stone	Pennsylvania, Ohio, Michigan, Illinois	Pennsylvania, Ohio, Illinois, Indiana.
12	Sulfur (Frasch-process)	Texas, Louisiana	Rank same as for quantity.
75	Sulfur ore for direct agricultural use	California, Nevada, Wyoming, Colorado	Do.
25	Talc, pyrophyllite and ground soapstone	New York, North Carolina, California, Vermont	New York, California, North Carolina, Vermont.
78	Tin (in ores and concentrates)	Colorado	Rank same as for quantity.
	Titanium concentrates:		
35	Ilmenite	New York, Florida, Virginia, North Carolina	Do.
67	Rutile	Florida	Do.
51	Tripoli	Missouri, Illinois, Pennsylvania	Do.
27	Tungsten concentrates	California, North Carolina, Nevada, Idaho	Do.
46	Vermiculite	Montana, South Carolina, North Carolina, Wyoming	Do.
80	Wollastonite	New York	Do.
10	Zinc (in ores, etc.)	Idaho, Montana, Arizona, New Jersey	Idaho, Montana, New Jersey, Arizona.
56	Zirconium concentrates	Florida	Rank same as for quantity.

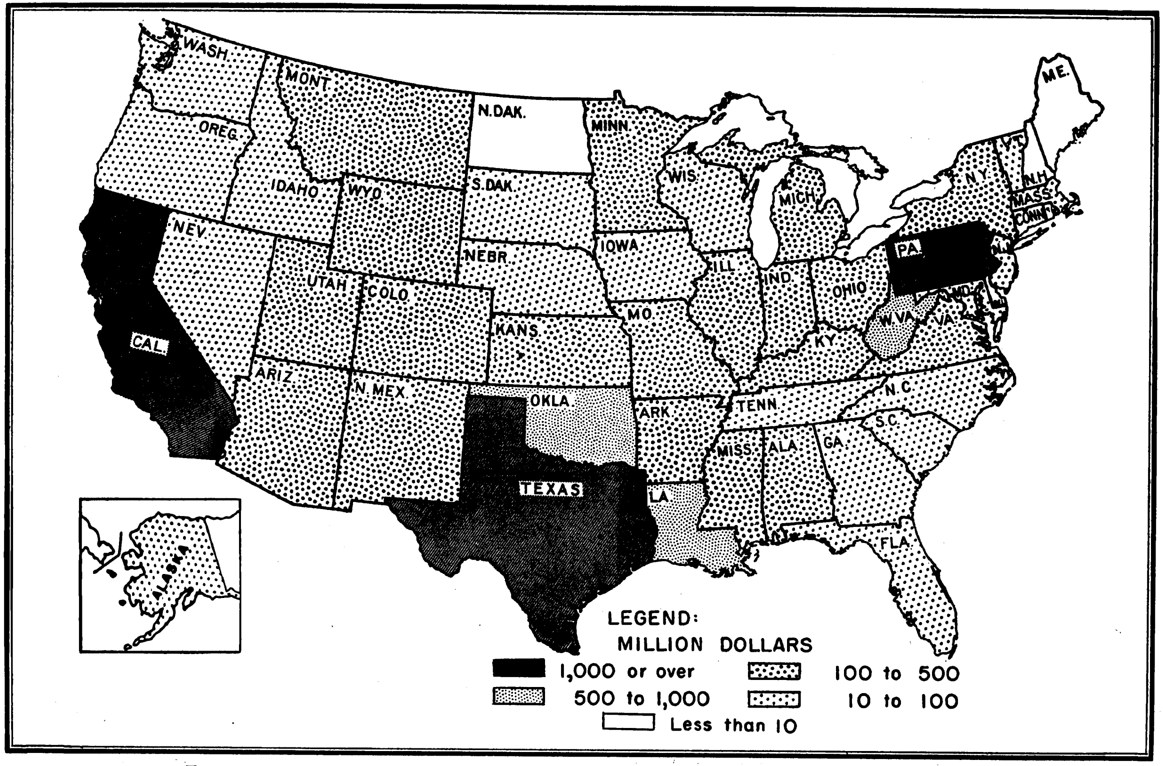

FIGURE 3.—Value of mineral production in continental United States and Alaska, 1950, by States.

TABLE 4.—Value of mineral production in continental United States, 1947–50, by States, in thousands of dollars, and principal minerals produced in 1950

State	1947	1948	1949	1950			
				Value	Rank	Percent of U. S. total	Principal minerals in order of value
Alabama	158,275	183,797	143,905	158,975	18	1.34	Coal, iron ore, cement, stone.
Arizona	186,092	200,382	181,094	207,406	15	1.75	Copper, zinc, lead, silver.
Arkansas	90,857	122,089	109,523	118,642	22	1.00	Petroleum, coal, bauxite, stone.
California	843,413	1,146,410	1,075,612	1,056,047	3	8.91	Petroleum, natural-gas liquids, natural gas, cement.
Colorado	102,448	128,861	139,858	154,897	20	1.31	Petroleum, molybdenum, coal, zinc.
Connecticut	3,863	4,484	4,887	5,675	45	.05	Stone, sand and gravel, lime, clays.
Delaware	340	403	335	522	48		Sand and gravel, stone, clays.
District of Columbia	61	64	63	60	49		Clays.
Florida	45,847	53,654	55,018	67,717	28	.57	Phosphate rock, stone, cement, sand and gravel.
Georgia	32,009	36,103	35,508	44,157	32	.37	Clays, stone, cement, sand and gravel.
Idaho	66,822	79,128	64,292	79,077	27	.67	Lead, zinc, silver, sand and gravel.
Illinois	425,380	521,038	449,894	488,144	7	4.12	Coal, petroleum, stone, cement.
Indiana	133,862	161,950	141,025	166,632	17	1.41	Coal, petroleum, cement, stone.
Iowa	31,023	35,955	37,458	41,773	33	.35	Cement, stone, coal, sand and gravel.
Kansas	265,061	361,160	337,162	368,614	9	3.11	Petroleum, natural gas, cement, stone.
Kentucky	426,101	504,080	372,229	459,956	8	3.88	Coal, petroleum, natural gas, stone.
Louisiana	404,779	604,198	631,813	693,607	5	5.85	Petroleum, natural-gas liquids, natural gas, sulfur.
Maine	5,784	8,094	6,742	7,461	44	.06	Cement, stone, sand and gravel, slate.
Maryland	23,291	25,002	20,461	22,725	37	.19	Sand and gravel, cement, stone, coal.
Massachusetts	10,576	12,583	12,449	16,014	40	.13	Stone, sand and gravel, lime, clays.
Michigan	166,634	202,885	201,260	229,862	12	1.94	Iron ore, petroleum, cement, salt.
Minnesota	218,374	267,248	257,540	331,567	10	2.80	Iron ore, sand and gravel, stone, cement.
Mississippi	67,644	119,317	103,711	102,945	25	.87	Petroleum, natural gas, natural-gas liquids, clays.
Missouri	103,928	108,291	111,293	113,191	23	.95	Lead, cement, stone, coal.
Montana	87,735	103,841	98,070	103,389	24	.87	Copper, petroleum, zinc, manganese.
Nebraska	6,704	8,385	10,102	14,022	41	.12	Cement, petroleum, sand and gravel, stone.
Nevada	40,926	42,503	37,372	48,499	30	.41	Copper, gold, zinc, lead.
New Hampshire	1,254	1,331	1,384	1,711	46	.01	Sand and gravel, stone, feldspar, beryllium.
New Jersey	38,433	44,388	38,584	46,391	31	.39	Zinc, stone, sand and gravel, iron ore.
New Mexico	157,548	220,080	198,825	210,294	14	1.77	Petroleum, potassium salts, copper, natural-gas liquids.

New York	122,333	143,623	138,493	156,529	19	1.32	Cement, iron ore, stone, sand and gravel.
North Carolina	16,386	18,231	19,755	26,343	36	.22	Stone, sand and gravel, tungsten, talc, pyrophyllite and ground soapstone.
North Dakota	6,258	8,478	8,818	9,614	43	.08	Coal (lignite), sand and gravel, stone, natural gas.
Ohio	244,444	284,816	242,080	274,572	11	2.32	Coal, stone, lime, cement.
Oklahoma	354,387	506,846	484,264	527,095	6	4.45	Petroleum, natural-gas liquids, natural gas, coal.
Oregon	15,865	23,923	21,845	21,542	38	.18	Sand and gravel, cement, stone, diatomite.
Pennsylvania	1,248,817	1,386,960	1,035,970	1,186,212	2	10.01	Coal, cement, petroleum, stone.
Rhode Island	785	1,450	929	1,425	47	.01	Stone, sand and gravel, graphite.
South Carolina	7,589	8,885	9,026	11,394	42	.10	Clays, stone, cement, vermiculite.
South Dakota	23,590	24,327	26,723	32,716	35	.28	Gold, stone, sand and gravel, clays.
Tennessee	79,941	93,599	77,333	89,694	26	.76	Coal, cement, stone, zinc.
Texas	1,945,634	2,830,283	2,379,793	2,673,950	1	22.55	Petroleum, natural-gas liquids, natural gas, sulfur.
Utah	206,015	204,459	177,825	229,956	13	1.94	Copper, coal, gold, molybdenum.
Vermont	14,717	15,999	17,384	18,563	39	.16	Stone, slate, asbestos, copper.
Virginia	130,296	143,333	116,408	137,806	21	1.16	Coal, stone, cement, sand and gravel.
Washington	38,051	48,928	40,863	49,055	29	.41	Cement, sand and gravel, coal, stone.
West Virginia	857,670	1,012,402	718,119	829,624	4	7.00	Coal, natural gas, petroleum, stone.
Wisconsin	34,491	37,108	35,878	41,693	34	.35	Stone, sand and gravel, iron ore, cement.
Wyoming	117,395	172,004	150,998	177,577	16	1.50	Petroleum, coal, natural-gas liquids, clays.
Total	9,610,000	12,273,000	10,580,000	11,855,000	--------	100.00	Petroleum, coal, cement, iron ore.

232294—53——4

TABLE 5.—Value of mineral production in continental United States, 1925–46, by States, in thousands of dollars [1]

Year	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	D. C.	Florida	Georgia	Idaho	Illinois	Indiana
1925	77, 139	114, 203	84, 296	478, 420	63, 513	6, 755	539	955	16, 626	16, 518	31, 611	231, 542	111, 754
1926	83, 710	115, 053	80, 670	504, 663	65, 519	7, 695	378	987	19, 701	17, 480	31, 758	237, 141	118, 690
1927	78, 641	100, 564	56, 655	428, 021	58, 754	7, 308	495	1, 375	18, 122	16, 758	29, 189	180, 308	107, 476
1928	69, 807	116, 005	42, 744	399, 297	58, 108	7, 609	482	1, 031	15, 253	14, 740	28, 594	188, 044	98, 394
1929	65, 402	157, 965	38, 827	515, 122	54, 731	7, 062	467	1, 065	14, 830	15, 294	32, 148	182, 710	96, 838
1930	55, 462	82, 939	32, 384	435, 228	45, 409	5, 494	425	1, 288	15, 510	12, 831	22, 909	148, 045	78, 911
1931	38, 507	41, 608	16, 678	249, 679	32, 117	4, 309	395	282	10, 877	10, 291	13, 182	107, 236	50. 496
1932	19, 170	15, 209	13, 819	230, 653	25, 113	1, 911	300	1, 819	7, 125	7, 490	9, 478	70, 821	34, 148
1933	23, 292	12, 576	11, 357	235, 267	26, 671	1, 551	135	423	8, 861	7, 529	12, 423	74, 020	33, 533
1934	29, 828	26, 068	14, 994	276, 951	38, 892	2, 277	272	407	11, 549	7, 987	16, 660	88, 070	38, 842
1935	31, 772	38, 848	16, 652	298, 612	43, 871	2, 656	230	479	11, 447	9, 804	21, 353	95, 762	41, 807
1936	44, 753	60, 533	20, 052	376, 032	55, 532	3, 318	444	548	12, 974	11, 757	29, 951	117, 563	51, 271
1937	53, 519	94, 564	24, 231	407, 491	66, 781	3, 690	397	523	13, 812	12, 584	40, 615	132, 989	54, 118
1938	46, 296	60, 756	27, 678	423, 661	59, 975	3, 060	321	569	12, 867	11, 598	31, 738	129, 588	47, 346
1939	52, 325	75, 123	28, 182	399, 232	63, 925	4, 407	413	592	13, 161	14, 664	33, 268	210, 321	54, 038
1940	65, 143	85, 327	35, 534	386, 718	62, 900	4, 002	467	640	14, 942	16, 960	40, 929	277, 384	58, 892
1941	82, 854	100, 524	45, 009	433, 791	73, 536	5, 360	501	700	19, 343	21, 082	45, 809	319, 675	80, 207
1942	100, 223	118, 006	57, 735	456, 977	94, 426	4, 852	402	600	20, 304	22, 009	54, 320	325, 846	88, 858
1943	102, 584	124, 588	77, 192	471, 695	87, 345	3, 337	367	100	25, 070	20, 927	57, 480	320, 077	82, 524
1944	109. 149	115, 602	64, 098	503, 165	79, 147	3, 037	182	111	21, 896	19, 005	51, 322	329, 147	89, 760
1945	110, 360	98, 584	58, 262	514, 934	77, 237	3, 152	131	229	24, 928	19, 988	44, 349	330, 184	88, 802
1946	123, 029	118, 106	65, 995	592, 372	77, 630	5, 584	491	710	31, 093	30, 454	44, 449	358, 628	107, 479

Year	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Mass.	Michigan	Minnesota	Mississippi	Missouri	Montana
1925	38, 420	135, 166	129, 195	57, 049	5, 839	21, 558	16, 832	122, 212	110, 253	2, 172	92, 522	78, 608
1926	35, 972	155, 397	144, 351	58, 300	5, 786	24, 067	16, 787	130, 860	118, 361	1, 883	90, 003	79, 116
1927	33, 454	110, 799	150, 283	44, 718	5, 503	20, 469	16, 297	124, 058	102, 979	2, 547	75, 890	67, 298
1928	35, 527	102, 199	128, 298	44, 049	5, 950	18, 418	16, 236	123, 456	108, 281	2, 617	74, 795	73, 164
1929	35, 983	114, 044	127, 334	44, 134	6, 776	18, 470	16, 033	151, 038	136, 356	2, 548	78, 816	91, 338
1930	33, 386	90, 774	106, 260	44, 412	6, 255	14, 990	12, 725	110, 773	103, 937	1. 699	68, 821	47, 694
1931	21, 643	48, 394	68, 861	30, 620	4, 916	11, 330	11, 172	62. 572	55, 281	1, 180	41, 244	29, 058
1932	18, 540	48, 099	49, 562	30, 232	3, 174	7. 234	8, 039	34, 358	12, 275	775	28, 822	14, 905
1933	15, 172	47, 298	54, 992	28, 692	2, 594	7, 016	4, 918	53, 443	42, 475	955	30, 268	17, 608
1934	19, 327	69. 640	78, 427	50, 531	2, 353	10, 131	6, 167	59. 859	48, 332	840	32, 725	27, 314
1935	21, 710	81, 678	85, 575	69, 833	2, 560	10, 036	5, 650	74, 632	57, 313	1, 260	35, 605	46, 999
1936	28, 360	101, 829	99, 605	108, 817	3, 424	11, 160	7, 560	96, 868	94, 570	1, 704	41, 215	59, 816
1937	26, 941	127, 565	111, 290	139, 057	4, 129	10, 635	7, 813	113, 415	152, 107	2, 358	52, 258	76, 030
1938	24, 794	105, 439	92, 757	133, 997	3, 549	9, 408	6, 666	74, 909	51, 425	2, 653	38, 864	43, 105
1939	25, 356	97, 109	98, 248	125, 745	3, 870	12, 257	8, 529	108, 277	106, 745	2, 689	45, 735	57, 914
1940	26, 168	102, 587	116, 053	136, 767	4, 468	13, 019	7, 822	115, 111	128, 823	6, 020	50, 419	73, 444
1941	29, 010	140, 054	149, 376	170, 625	4, 777	17, 644	9, 505	131, 704	179, 005	16, 942	61, 576	80, 157
1942	28, 278	168, 272	181, 261	181, 669	3, 619	18, 384	8, 467	148, 084	191, 650	29, 506	76, 083	89, 496
1943	24, 187	177, 308	210, 352	198, 155	2, 721	17, 508	5, 441	139, 016	177, 687	20, 893	72, 156	84, 768
1944	22, 452	170, 560	250, 735	217, 522	2, 152	15, 264	5, 263	132, 938	170, 488	18, 675	72, 890	81, 730
1945	25, 008	166, 644	250, 919	222, 173	2, 523	15, 329	5, 450	123, 896	167, 139	21, 370	74, 347	68, 537
1946	35, 957	194, 563	272, 558	273, 882	4, 399	21, 991	9, 745	133, 162	155, 744	33, 672	88, 357	61, 833

Year	Nebraska	Nevada	N. H.	New Jersey	N. Mex.	New York	N. C.	N. Dak.	Ohio	Oklahoma	Oregon	Pa.	R. I.
1925	3,359	26,470	3,465	76,764	25,693	100,121	9,504	2,662	232,882	484,093	7,827	844,490	1,152
1926	3,322	27,618	4,145	77,066	28,516	109,754	10,994	2,805	237,262	550,207	6,961	1,030,838	1,339
1927	3,542	26,758	3,448	73,216	28,610	110,163	11,705	2,870	206,729	504,712	6,841	914,146	1,311
1928	3,455	34,887	3,817	70,990	30,409	105,594	11,481	3,082	189,091	460,142	6,707	862,178	831
1929	4,845	36,781	3,727	72,017	36,749	106,676	10,965	3,466	196,826	486,885	6,897	872,288	940
1930	4,962	24,080	3,338	57,331	30,895	96,339	7,463	3,056	161,355	360,188	6,190	759,768	1,209
1931	3,623	14,969	2,797	41,758	23,364	75,266	5,555	2,271	108,536	160,941	5,065	577,945	793
1932	1,548	6,573	1,361	23,193	18,185	46,667	2,466	2,386	68,061	166,875	2,989	408,058	506
1933	2,048	7,461	1,466	22,702	21,363	40,035	3,366	2,961	74,267	158,295	3,506	404,986	387
1934	2,791	14,708	1,149	25,012	27,068	51,904	5,344	2,550	100,182	221,277	4,213	528,240	486
1935	3,229	20,993	694	28,515	29,718	54,392	6,775	2,544	110,113	231,853	5,596	501,424	571
1936	3,844	32,699	1,182	24,423	41,040	65,762	9,957	2,903	108,172	283,077	7,082	578,241	929
1937	4,838	38,877	1,220	31,468	65,871	68,686	11,160	2,873	117,912	341,532	6,630	578,181	863
1938	4,029	27,031	1,147	24,409	56,645	59,511	14,959	2,629	93,179	250,706	7,636	457,176	912
1939	4,526	34,777	1,224	30,966	62,245	68,346	18,785	2,708	108,946	213,878	9,168	514,185	1,031
1940	4,810	42,689	1,097	34,110	71,767	71,125	21,336	3,010	117,468	207,803	11,805	595,607	1,038
1941	6,600	46,595	1,410	39,463	87,683	86,610	19,117	3,332	151,162	240,476	13,161	714,878	1,170
1942	8,428	45,819	1,216	38,921	94,848	98,935	17,373	3,992	158,122	240,769	14,116	817,922	836
1943	6,800	40,876	1,350	37,583	111,147	84,160	22,172	4,367	162,100	221,631	12,287	865,282	808
1944	5,060	37,852	1,164	33,828	112,186	83,720	22,201	4,334	166,879	225,833	9,687	962,208	612
1945	4,963	31,193	802	31,267	104,239	88,678	14,766	4,505	175,443	243,314	9,493	913,232	508
1946	7,277	35,484	1,451	33,518	111,968	103,576	20,428	5,118	221,356	263,282	12,107	1,074,004	561

Year	S. C.	S. Dak.	Tennessee	Texas	Utah	Vermont	Virginia	Wash.	W. Va.	Wisconsin	Wyoming	Total
1925	3,508	7,970	38,848	338,537	99,910	14,409	41,038	22,382	287,476	19,205	76,505	4,812,000
1926	3,677	7,597	39,123	402,510	98,753	14,955	46,136	21,267	344,128	20,712	76,527	5,311,000
1927	4,251	8,351	37,705	348,286	90,053	14,703	41,323	21,988	322,567	21,777	54,667	4,698,000
1928	4,046	9,410	38,882	337,632	97,211	14,649	38,770	22,142	293,031	20,938	51,072	4,484,000
1929	3,592	8,897	40,232	443,924	114,825	14,603	39,753	22,457	302,156	24,222	49,062	4,908,000
1930	3,341	11,067	31,897	396,991	63,982	11,637	34,641	20,060	249,576	17,711	44,067	3,980,000
1931	3,031	11,351	23,932	238,580	40,146	8,422	26,134	14,765	187,161	11,843	27,873	2,578,000
1932	951	11,130	14,512	310,845	22,443	6,401	16,895	12,760	130,716	7,414	24,211	2,000,000
1933	1,014	14,672	16,598	288,641	24,056	5,793	18,921	9,321	148,617	7,155	19,420	2,050,000
1934	1,324	19,180	23,043	427,614	32,093	4,853	28,311	12,880	216,381	9,754	24,722	2,744,000
1935	1,843	22,207	24,924	440,256	41,754	5,097	30,961	13,605	219,194	11,818	27,376	2,942,000
1936	3,433	23,219	30,362	541,443	60,995	6,225	37,129	22,835	237,219	13,279	30,800	3,606,000
1937	4,022	23,471	34,005	700,524	105,087	7,043	46,134	26,569	267,258	15,240	37,099	4,265,000
1938	4,364	23,581	31,612	626,428	58,319	6,440	42,375	21,085	216,563	10,637	33,343	3,518,000
1939	5,489	24,866	39,332	581,328	79,291	6,991	44,264	31,897	233,420	13,068	35,398	3,808,000
1940	5,363	23,579	41,870	593,403	103,606	6,996	50,281	28,427	277,302	13,870	38,752	4,198,000
1941	7,294	24,549	55,213	725,407	121,458	8,146	71,547	28,782	369,092	17,290	48,093	5,107,000
1942	5,891	24,138	65,664	738,218	146,062	7,266	79,694	35,690	432,805	17,998	58,708	5,623,000
1943	4,759	8,606	62,778	904,469	163,155	6,404	85,758	36,695	500,099	18,930	64,950	5,931,000
1944	4,192	5,472	62,461	1,111,363	147,878	7,672	86,952	33,267	547,851	22,798	68,044	6,310,000
1945	5,043	7,138	57,104	1,141,941	127,537	8,249	81,965	31,301	537,212	22,217	74,625	6,231,000
1946	8,189	18,394	66,201	1,309,579	95,520	12,096	90,823	33,109	588,925	28,596	78,815	7,062,000

[1] New basis, except that for lack of sufficient data the value of heavy clay products for the years shown here has not been replaced by that of the raw clays used in such products.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals

ALABAMA

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Cement [1] ... thousands of 376-pound barrels	9,510	16,664	9,949	20,140	9,394	20,321	10,575	23,176
Clays (except for cement) ... thousand short tons	853	955	956	1,076	857	934	993	1,045
Coal ... do	19,048	104,303	18,801	115,535	12,934	79,188	[2] 14,422	[2] 88,343
Iron ore (usable) ... thousand long tons, gross weight	7,208	23,437	8,024	32,544	7,314	27,553	7,402	28,933
Lime (open-market) ... short tons	345,160	2,727	388,197	3,275	359,446	3,203	389,071	3,578
Manganese ore (35 percent or more Mn) ... short tons, gross weight							138	(3)
Natural gas ... million cubic feet							2	(4)
Peat ... short tons			2,034	12				
Petroleum (crude) ... thousands of 42-gallon barrels	396	(3)	466	(3)	462	(3)	[2] 735	(3)
Sand and gravel ... thousand short tons	3,400	2,272	3,619	2,406	3,297	2,268	3,616	2,464
Stone (except for cement and lime) ... do	2,795	4,625	2,476	4,482	2,637	6,040	2,588	6,038
Undistributed: Native asphalt, bauxite, puzzolan cement, graphite, mica (1947), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		3,292		4,327		4,398		5,398
Total Alabama		158,275		183,797		[5] 143,905		158,975
Clays sold or used for cement ... thousand short tons	282	141	304	184	328	202	357	268
Coke ... do	5,870	47,087	6,015	57,612	5,161	55,493	5,833	64,332
Ferro-alloys ... short tons	132,603	15,030	129,615	16,817	99,268	14,276	165,002	23,403
Iron, pig ... thousand short tons	3,928	110,437	3,981	145,359	3,665	131,162	4,307	167,984

ARIZONA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays ... thousand short tons	184	292	178	326	190	433	224	512
Coal ... do	10	46	5	24	5	23	[2] 4	[2] 27
Copper (recoverable content of ores, etc.) ... short tons	366,218	153,812	375,121	162,803	359,010	141,450	403,301	167,773
Fluorspar ... do	1,601	(3)	1,271	(3)	846	(3)	952	(3)
Gold (recoverable content of ores, etc.) ... troy ounces	95,860	3,355	109,487	3,832	108,993	3,815	118,313	4,141
Gypsum (crude) ... short tons	23,980	129	(3)	(3)	(3)	(3)	(3)	(3)
Lead (recoverable content of ores, etc.) ... do	28,566	8,227	29,899	10,704	33,568	10,607	26,383	7,123
Lime (open-market) ... do	54,562	582	54,608	763	43,529	608	51,530	718

Manganese ore (35 percent or more Mn) ....short tons, gross weight..	133	(3)	240	(3)	223	(3)	222	(3)
Manganiferous ore (5 to 35 percent Mn) ....do....	62	(3)	----------	----------	----------	----------	----------	----------
Perlite (crude) ....short tons..	(3)	(3)	(3)	(3)	519	3	1,923	11
Sand and gravel ....thousand short tons..	1,608	1,368	2,014	1,799	1,512	971	2,499	1,590
Silver (recoverable content of ores, etc.) ....thousand troy ounces..	4,569	4,135	4,838	4,379	4,971	4,499	5,325	4,820
Stone (except limestone for cement and lime) ....thousand short tons..	354	220	308	263	356	203	228	140
Tungsten concentrate ....short tons, 60-percent WO_3 basis..	13	(3)	23	30	(6)	(3)	1	(3)
Zinc (recoverable content of ores, etc.) ....short tons..	54,644	13,224	54,478	14,491	70,658	17,523	60,480	17,176
Undistributed: Asbestos, barite, beryllium concentrate (1949–50), cement (1949–50), feldspar, gem stones, mica (1947, 1949–50), molybdenum concentrate, pumice (1949), quartz, vanadium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	702	----------	968	----------	959	----------	3,375
Total Arizona	----------	[5] 186,092	----------	[5] 200,382	----------	[5] 181,094	----------	207,406

ARKANSAS

Antimony ore and concentrate ....short tons, gross weight..	2	1	----------	----------	----------	----------	----------	----------
Barite (crude) ....short tons..	376,017	2,391	362,470	2,900	363,382	2,907	343,168	3,089
Bauxite ....long tons, dried equivalent..	1,153,563	6,583	1,395,341	8,299	1,094,924	6,434	1,307,335	7,532
Clays (except for cement) ....thousand short tons..	381	876	441	1,076	434	1,067	461	996
Coal ....do....	1,871	12,475	1,662	12,879	962	7,535	[2] 1,169	[2] 8,883
Gem stones and industrial diamonds ....carats..	----------	----------	(7)	(7)	[7] 246	[7] 1	----------	----------
Iron ore (usable) ....thousand long tons, gross weight..	----------	----------	----------	----------	----------	----------	1	(3)
Lead (recoverable content of ores, etc.) ....short tons..	18	5	22	8	1	(4)	9	2
Manganese ore (35 percent or more Mn) ....short tons, gross weight..	841	(3)	212	(3)	2,851	(3)	1,224	(3)
Manganiferous ore (5 to 35 percent Mn) ....do....	2,094	(3)	1,165	(3)	5,555	(3)	6,359	(3)
Natural gas ....million cubic feet..	50,630	1,818	53,946	2,422	[5] 47,788	[5] 1,912	[2] 48,047	[2] 1,682
Natural-gas liquids:								
Natural gasoline ....thousands of 42-gallon barrels..	1,352	3,668	1,388	5,454	[5] 1,427	[5] 4,080	[2] 1,395	[2] 3,926
LP-gases ....do....	888	1,271	871	2,021	[5] 853	[5] 1,492	[2] 938	[2] 1,197
Petroleum (crude) ....do....	29,948	54,500	31,682	78,570	[5] 29,986	[5] 74,360	[2] 31,108	[2] 76,530
Sand and gravel ....thousand short tons..	[8] 2,690	[8] 2,267	[8] 2,545	[8] 2,079	[8] 2,507	[8] 2,129	4,118	3,447
Stone (except limestone for cement and lime) ....do....	[9] 210	[9] 449	1,379	1,884	[9] 1,279	[9] 2,247	3,953	7,419
Zinc (recoverable content of ores, etc.) ....short tons..	18	4	31	8	1	(4)	8	2
Undistributed: Abrasive stones, cement, gypsum, lime, noncommercial sand and gravel (1947–49), slate, stone (unclassified 1947 and 1949), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	4,549	----------	4,489	----------	5,359	----------	3,937
Total Arkansas	----------	90,857	----------	122,089	----------	[5] 109,523	----------	118,642
Clays sold or used for cement ....thousand short tons..	22	11	27	20	18	14	14	11

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

CALIFORNIA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Antimony ore and concentrate......short tons, gross weight..	----	----	5	2	----	----	----	----
Boron minerals......short tons..	501, 935	11, 844	450, 932	11, 148	467, 592	11, 512	647, 735	15, 890
Calcium-magnesium chloride......short tons, 75-percent (Ca, Mg) Cl_2 basis..	7, 968	112	10, 009	168	11, 166	204	([3])	([3])
Carbon dioxide, natural (estimated)......thousand cubic feet..	([3])	([3])	([3])	([3])	([3])	([3])	200, 000	200
Cement......thousands of 376-pound barrels..	22, 846	46, 540	24, 163	57, 742	23, 202	57, 464	26, 685	65, 259
Chromite......short tons, gross weight..	948	([3])	274	([3])	433	12	404	([3])
Clays (except for cement)......thousand short tons..	1, 494	2, 725	1, 758	3, 252	} 1, 391	2, 744	1, 455	2, 905
Fuller's earth......do....	([3])	([3])	([3])	([3])				
Coal (lignite)......do....	----	----	1	15	4	39	([3])	([3])
Copper (recoverable content of ores, etc.)......short tons..	2, 407	1, 011	481	209	649	256	646	269
Gold (recoverable content of ores, etc.)......troy ounces..	431, 415	15, 100	421, 473	14, 752	417, 231	14, 603	412, 118	14, 424
Gypsum (crude)......short tons..	811, 798	1, 996	962, 038	2, 354	753, 581	1, 853	962, 373	2, 463
Iron ore (usable)......thousand long tons, gross weight..	374	([3])	346	([3])	584	([3])	849	([3])
Lead (recoverable content of ores, etc.)......short tons..	10, 080	2, 903	9, 110	3, 261	10, 318	3, 261	15, 831	4, 274
Lime (open-market)......do....	181, 296	2, 616	179, 257	3, 027	153, 483	2, 516	171, 440	2, 723
Magnesium compounds from sea water and bitterns (partly estimated) short tons, MgO equivalent..	40, 000	2, 161	38, 500	2, 549	27, 600	1, 770	([3])	([3])
Manganese ore (35 percent or more Mn)......short tons, gross weight..	----	----	----	----	280	([3])	37	([3])
Manganiferous ore (5 to 35 percent Mn)......do....	----	----	----	----	386	([3])	640	6
Mercury......76-pound flasks..	17, 165	1, 437	11, 188	856	4, 493	357	3, 850	313
Natural gas......million cubic feet..	560, 510	57, 284	570, 954	64, 803	[5] 550, 903	[5] 64, 731	[2] 558, 398	[2] 66, 449
Natural-gas liquids:								
Natural gasoline and cycle products......thousands of 42-gallon barrels..	19, 845	46, 302	20, 118	62, 834	[5] 20, 568	[5] 67, 407	[2] 21, 247	[2] 65, 527
LP-gases......do....	5, 491	7, 901	6, 431	16, 527	[5] 6, 585	[5] 19, 553	[2] 7, 081	[2] 14, 497
Peat......short tons..	3, 431	22	6, 942	33	5, 670	35	6, 399	37
Perlite......do....	----	----	([3])	([3])	4, 043	27	([3])	([3])
Petroleum (crude)......thousands of 42-gallon barrels..	333, 132	572, 990	340, 074	822, 980	[5] 332, 942	[5] 752, 450	[2] 327, 607	[2] 707, 630
Platinum-group metals (crude)......troy ounces..	324	([3])	([3])	([3])	([3])	([3])	([3])	([3])
Pumice and pumicite......short tons..	169, 037	1, 026	196, 934	1, 110	149, 878	800	157, 497	971
Salt (common)......thousand short tons..	768	3, 811	914	3, 928	965	4, 110	868	3, 817
Sand and gravel......do....	31, 387	25, 339	33, 787	30, 593	36, 280	30, 199	41, 894	35, 548
Silver (recoverable content of ores, etc.)......thousand troy ounces..	1, 597	1, 446	725	656	784	709	1, 072	970
Sodium carbonate (natural)......short tons..	293, 051	5, 862	288, 769	6, 623	200, 496	4, 164	([3])	([3])
Stone (except limestone for cement and lime)......thousand short tons..	[9] 12, 758	[9] 13, 013	[9] 11, 936	[9] 13, 155	11, 374	12, 594	11, 765	13, 998
Sulfur ore for direct agricultural use......long tons..	698	9	([3])	([3])	1, 302	26	1, 463	28
Talc, pyrophyllite, and ground soapstone......short tons..	91, 537	1, 595	98, 681	1, 774	83, 359	1, 434	109, 747	2, 069
Tungsten concentrate......short tons, 60-percent WO_3 basis..	394	548	1, 767	([3])	952	([3])	2, 025	3, 392
Zinc (recoverable content of ores, etc.)......short tons..	5, 415	1, 311	5, 325	1, 416	7, 209	1, 788	7, 551	2, 144
Undistributed: Abrasive stones (1947–49), asbestos, native asphalt (1947), barite, bromine, diatomite, feldspar, gem stones, iodine, lithium minerals, magnesite, mica (1947), molybdenum concentrate, potassium salts, pyrites, quartz, ground sand and sandstone, slate, sodium sulfate, stone (marble 1947,								

dimension basalt 1948), titanium concentrate (1948–49), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	16,509	-----	20,643	-----	18,994	-----	30,244
Total California	-----	843,413	-----	[5] 1,146,410	-----	[5] 1,075,612	-----	1,056,047
Clays sold or used for cement ... thousand short tons	457	240	916	561	839	504	830	623
Coke ... do	332	(10)	297	(10)	347	(10)	513	(10)
Ferro-alloys ... short tons	5,278	(10)	(10)	(10)	(10)	(10)	(10)	(10)
Iron, pig ... thousand short tons	453	(10)	375	(10)	494	(10)	667	(10)
COLORADO								
Beryllium concentrate ... short tons, gross weight	(3)	(3)	(3)	(3)	(3)	(3)	97	30
Carbon dioxide, natural (estimated) ... thousand cubic feet	23,000	9	16,000	6	8,000	3	-----	-----
Clays (except for cement) ... thousand short tons	275	427	299	488	255	499	310	619
Coal ... do	6,358	28,772	5,631	27,826	4,636	23,735	[2] 4,259	[2] 21,669
Copper (recoverable content of ores, etc.) ... short tons	2,150	903	2,298	997	2,403	947	3,141	1,307
Feldspar (crude) ... long tons	43,676	219	62,497	253	60,966	341	59,457	329
Fluorspar ... short tons	32,153	951	27,698	831	22,324	763	18,489	654
Gold (recoverable content of ores, etc.) ... troy ounces	168,279	5,890	154,802	5,418	102,618	3,592	130,390	4,564
Gypsum (crude) ... short tons	(3)	(3)	(3)	(3)	(3)	(3)	62,150	184
Lead (recoverable content of ores, etc.) ... do	18,696	5,384	25,143	9,001	26,853	8,486	27,007	7,292
Manganiferous ore (5 to 35 percent Mn) ... short tons, gross weight	37	(3)	-----	-----	-----	-----	-----	-----
Mica (scrap) ... short tons	1,341	13	5,907	53	4,168	60	1,467	27
Molybdenum (content of ore and concentrate) ... thousand pounds	10,783	(3)	12,630	(3)	10,483	(3)	24,090	(3)
Natural gas ... million cubic feet	8,392	660	8,967	539	[5] 8,490	[5] 443	[2] 11,168	[2] 436
Natural-gas liquids:								
Natural gasoline ... thousands of 42-gallon barrels	24	68	28	120	[5] 152	[5] 463	[2] 217	[2] 584
LP-gases ... do	-----	-----	5	12	[5] 189	[5] 281	[2] 169	[2] 289
Peat ... short tons	(3)	(3)	(3)	(3)	2,800	24	3,210	28
Perlite (crude) ... do	526	3	3,000	21	12,729	89	13,691	96
Petroleum (crude) ... thousands of 42-gallon barrels	15,702	29,680	17,862	45,730	[5] 23,587	[5] 60,150	[2] 23,303	[2] 59,420
Pyrites ... long tons	(3)	(3)	(3)	(3)	13,877	50	(3)	(3)
Sand and gravel ... thousand short tons	3,525	2,324	4,906	2,658	4,751	2,965	5,154	3,940
Silver (recoverable content of ores, etc.) ... thousand troy ounces	2,558	2,315	3,011	2,725	2,895	2,620	3,492	3,161
Stone (except limestone for cement and lime) ... thousand short tons	1,069	1,407	2,195	2,491	[9] 1,817	[9] 2,804	1,680	2,776
Tin (content of ore and concentrate) ... long tons	-----	-----	-----	-----	17	37	15	31
Tungsten concentrate ... short tons, 60-percent WO_3 basis	68	108	208	337	222	(3)	196	302
Vanadium (content of ore and concentrate) ... pounds	1,912,158	1,110	(3)	(3)	(3)	(3)	(3)	(3)
Zinc (recoverable content of ores, etc.) ... short tons	38,745	9,376	45,164	12,014	47,703	11,830	45,776	13,000
Undistributed: Cement, gem stones, lime (1947-49), lithium minerals (1947), pumice and pumicite (1947 and 1950), stone (dimension, unclassified, 1949), sulfur ore, vermiculite (1947, 1949–50), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	12,829	-----	17,341	-----	19,676	-----	34,159
Total Colorado	-----	[5] 102,448	-----	[5] 128,861	-----	[5] 139,858	-----	154,897
Clays sold or used for cement ... thousand short tons	102	51	160	120	215	161	192	144
Coke ... do	871	(10)	977	(10)	730	(10)	805	(10)
Ferro-alloys ... short tons	11,296	(10)	-----	-----	-----	-----	-----	-----

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

CONNECTICUT

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Clays .... thousand short tons..	185	135	315	230	289	217	292	236
Feldspar (crude) .... long tons..	15,408	100	12,110	79	12,659	95	13,580	102
Peat .... short tons..	5,061	26	4,332	24	5,974	33	6,294	35
Quartz from pegmatites and quartzite .... do....	----------	----------	----------	----------	16,225	97	27,560	167
Sand and gravel .... thousand short tons..	2,329	1,385	2,577	1,488	2,648	1,587	2,998	1,862
Stone (except limestone for lime) .... do....	1,363	1,929	1,525	2,283	1,696	2,461	1,861	2,789
Undistributed: Nonmetallic minerals	----------	288	----------	380	----------	397	----------	484
Total Connecticut	----------	3,863	----------	4,484	----------	4,887	----------	5,675

DELAWARE

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays .... thousand short tons..	(3)	(3)	(3)	(3)	33	46	41	40
Sand and gravel .... do....	235	195	(3)	(3)	234	197	368	292
Stone .... do....	(3)	(3)	36	90	37	92	77	190
Undistributed: Minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	145	----------	313	----------	----------	----------	----------
Total Delaware	----------	340	----------	403	----------	335	----------	522

FLORIDA

Clays (except for cement) ..... thousand short tons	55	507	(3)	(3)	96	1,447	127	1,955
Fuller's earth ..... do	(3)	(3)						
Natural gas ..... million cubic feet	8	(4)	27	1	[5] 39	2	[2] 8	(4)
Peat ..... short tons	42,300	126	24,750	56	11,800	69	23,022	151
Petroleum (crude) ..... thousands of 42-gallon barrels	259	(3)	290	(3)	441	(3)	[2] 487	(3)
Phosphate rock ..... thousand long tons	6,482	32,920	6,539	37,733	6,816	37,858	8,086	45,378
Sand and gravel ..... thousand short tons	2,067	1,881	2,312	2.433	2,244	1,880	2,794	2,807
Stone (except limestone for cement and lime) ..... do	3,534	4,512	[9] 4,155	[9] 5,116	4,215	4,748	5,313	6,885
Undistributed: Cement, lime, calcareous marl (1949), stone (unclassified, 1948), titanium concentrate, zirconium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	5,901	-----	8,315	-----	9,014	-----	10,541
Total Florida	-----	45,847	-----	53,654	-----	[5] 55,018	-----	67,717
Clays sold or used for cement ..... thousand short tons	42	21	49	37	80	40	84	63

GEORGIA

Barite (crude) ..... short tons	61,202	640	62,781	655	50,267	465	(3)	(3)
Clays (except for cement) ..... thousand short tons	1,822	13,362	2,125	15,378	1,983	16,653	2,325	20,938
Fuller's earth ..... do	(3)	(3)	(3)	(3)				
Coal ..... do	7	39	20	124	17	98	(3)	(3)
Gold (recoverable content of ores, etc.) ..... troy ounces	76	3	19	1	18	1	-----	-----
Iron ore (usable) ..... thousand long tons, gross weight	296	693	274	747	229	693	202	677
Lime (open-market) ..... short tons	10,141	111	6,141	58	7,028	67	11,998	122
Mica (scrap) ..... do	1,102	23	785	15	(3)	(3)	(3)	(3)
Peat ..... do	2.400	48	2,500	50	1,870	56	1,750	41
Sand and gravel ..... thousand short tons	927	575	986	720	[8] 984	[8] 758	[8] 1,212	[8] 937
Sand and sandstone (ground) ..... short tons	4,419	31	1,909	17	771	8	1,176	12
Silver (recoverable content of ores, etc.) ..... thousand troy ounces	(11)	(4)	(11)	(4)	-----	-----	-----	-----
Stone (except limestone for cement and lime) ..... thousand short tons	2,961	9,978	3,631	10,801	[9] 4,156	[9] 8,428	[9] 6,145	[9] 11,917
Talc ..... short tons	49,441	673	53,602	625	49,338	580	70,749	774
Undistributed: Asbestos, bauxite, cement, epsom salt from serpentine (1947), feldspar, kyanite (1948–49), mica sheet, sand and gravel (noncommercial, 1949–50), slate, stone (marble and dimension, unclassified, 1949–50), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	5,833	-----	6,912	-----	7,701	-----	8,739
Total Georgia	-----	32,009	-----	36,103	-----	35,508	-----	44,157
Clays sold or used for cement ..... thousand short tons	96	75	91	94	75	111	84	90

For footnotes see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

IDAHO

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Antimony ore and concentrate ......short tons, gross weight..	18,258	3,194	15,941	4,295	4,838	1,053	6,868	(3)
Clays (except for cement) ......thousand short tons..	24	29	26	27	25	31	26	31
Coal ......do....	------	------	------	------	3	25	------	------
Copper (recoverable content of ores, etc.) ......short tons..	1,640	689	1,624	705	1,438	566	2,107	876
Gold (recoverable content of ores, etc.) ......troy ounces..	64,982	2,274	58,454	2,046	77,829	2,724	79,652	2,788
Lead (recoverable content of ores, etc.) ......short tons..	78,944	22,736	88,544	31,699	79,299	25,058	100,025	27,007
Mercury ......76-pound flasks..	886	74	543	41	------	------	------	------
Phosphate rock ......thousand long tons..	(3)	(3)	431	2,094	(3)	(3)	(3)	(3)
Pumice and pumicite ......short tons..	98,618	120	79,426	94	71,373	105	93,990	121
Sand and gravel ......thousand short tons..	3,210	2,068	3,671	2,552	3,271	2,287	4,282	3,044
Sand and sandstone (ground) ......short tons..	------	------	------	------	------	------	3,700	29
Silver (recoverable content of ores, etc.) ......thousand troy ounces..	10,346	9,363	11,449	10,362	10,049	9,095	16,095	14,567
Stone (except limestone for cement) ......thousand short tons..	[9] 1,045	[9] 992	1,081	1,004	1,441	1,879	[9] 644	[9] 861
Tungsten concentrate ......short tons, 60-percent WO_3 basis..	61	(3)	86	(3)	66	(3)	222	(3)
Zinc (recoverable content of ores, etc.) ......short tons..	83,069	20,103	86,267	22,947	76,555	18,986	87,890	24,961
Undistributed: Barite (1949–50), cement, abrasive garnet, stone (unclassified 1947, crushed sandstone and limestone 1950), vanadium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	------	5,180	------	1,262	------	2,483	------	4,792
Total Idaho	------	66,822	------	79,128	------	64,292	------	79,077
Clays sold or used for cement ......thousand short tons..	8	4	8	6	------	------	------	------

ILLINOIS

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Cement ......thousands of 376-pound barrels..	7,155	13,219	7,573	15,201	7,977	16,646	7,858	16,920
Clays (including fuller's earth)[17] ......thousand short tons..	2,087	2,871	2,289	3,300	1,957	2,707	2,302	3,243
Coal ......do....	67,860	213,834	65,342	253,633	47,208	190,863	[2] 56,291	[2] 228,138
Fluorspar ......short tons..	167,157	6,149	172,561	6,322	120,881	4,622	154,623	6,111
Lead (recoverable content of ores, etc.) ......do....	2,325	670	3,695	1,323	3,824	1,208	2,729	737
Lime (open-market) ......do....	299,187	2,736	283,090	3,000	276,161	3,198	367,485	4,465
Marl, calcareous (except for cement) ......do....	(3)	(3)	2,025	1	------	------	------	------
Natural gas ......million cubic feet..	17,023	1,565	14,062	1,735	[5] 12,391	[5] 1,398	[2] 13,285	[2] 1,342

Natural-gas liquids:								
Natural gasoline .... thousands of 42-gallon barrels	1,123	4,008	1,085	5,575	[5] 905	[5] 3,533	[2] 989	[2] 3,019
LP-gases .... do	2,746	5,043	2,454	7,851	[5] 2,313	[5] 4,941	[2] 2,118	[2] 3,436
Petroleum (crude) .... do	66,459	139,560	64,808	179,520	[5] 64,501	[5] 178,670	[2] 62,028	[2] 171,820
Sand and gravel .... thousand short tons	16,293	13,156	17,400	15,102	17,128	14,781	18,695	16,532
Sand and sandstone (ground) .... short tons	198,500	1,614	232,971	1,943	217,577	1,887	263,122	2,278
Silver (recoverable content of ores, etc.) .... thousand troy ounces	2	2	4	4	3	3	2	2
Stone (except limestone for cement and lime) .... thousand short tons	[9] 15,545	[9] 18,160	[9] 18,533	[9] 22,823	17,054	20,682	17,911	21,970
Tripoli .... short tons	14,687	271	(3)	(3)	(3)	(3)	(3)	(3)
Zinc (recoverable content of ores, etc.) .... do	10,073	2,438	12,980	3,453	18,157	4,503	26,982	7,663
Undistributed: Peat, perlite (1949), stone (dimension sandstone, 1947; sandstone, 1948), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	....	84	....	252	....	252	....	468
Total Illinois	....	425,380	....	521,038	....	[5] 449,894	....	488,144
Clays sold or used for cement .... thousand short tons	148	78	237	172	236	171	218	163
Coke .... do	3,805	49,268	3,675	54,397	3,196	52,258	3,591	58,141
Iron, pig .... do	5,608	173,679	5,503	196,587	4,904	204,468	6,039	258,242
Sulfuric acid (from zinc smelting) .... short tons, 100-percent basis	173,275	2,316	116,773	1,649	71,700	1,094	118,434	1,715

INDIANA

Clays (except for cement) .... thousand short tons	934	1,198	963	1,095	1,023	1,198	1,159	1,396
Coal .... do	25,449	82,019	23,849	96,303	16,550	66,988	[2] 19,957	[2] 79,302
Marl, calcareous (except for cement) .... short tons	27,412	20	15,839	17	44,026	50	20,380	14
Natural gas .... million cubic feet	877	80	553	54	[5] 334	[5] 25	[2] 956	[2] 67
Peat .... short tons	3,957	15	2,288	12	7,949	28	5,793	19
Petroleum (crude) .... thousands of 42-gallon barrels	6,095	12,800	6,974	19,320	[5] 9,696	[5] 26,860	[2] 10,699	[2] 29,530
Pyrites .... long tons	821	3	470	2	559	2	(3)	(3)
Sand and gravel .... thousand short tons	9,232	6,687	9,439	7,092	8,887	6,695	9,723	7,516
Stone (except limestone for cement and lime) .... do	[9] 5,590	[9] 11,254	[9] 6,574	[9] 14,989	[9] 6,332	[9] 15,228	6,995	20,686
Undistributed: Abrasive stones, cement, lime, and stone (dimension sandstone, 1947; sandstone, 1948–49), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	....	19,786	....	23,066	....	23,951	....	28,102
Total Indiana	....	133,862	....	161,950	....	[5] 141,025	....	166,632
Clays sold or used for cement .... thousand short tons	248	157	247	191	273	204	253	210
Coke .... do	8,786	117,614	8,584	125,355	7,533	122,,528	8,256	138,881
Iron, pig .... do	6,386	195,211	6,496	245,946	6,028	248,700	7,013	297,569

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

IOWA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Cement ... thousands of 376-pound barrels	6,156	12,054	6,836	14,424	6,655	14,602	7,232	16,158
Clays (except for cement) ... thousand short tons	649	665	626	663	572	629	579	645
Coal ... do	1,684	6,429	1,670	7,020	1,724	6,912	[2] 1,891	[2] 6,977
Gypsum (crude) ... short tons	656,982	1,677	729,880	1,754	858,464	2,188	981,647	2,508
Peat ... do	(3)	(3)	(3)	(3)	(3)	(3)	3,000	19
Sand and gravel ... thousand short tons	6,473	2,796	8,040	3,729	7,978	4,447	8,995	4,796
Stone (except limestone for cement) ... do	5,586	7,386	6,388	8,333	6,831	8,663	8,425	10,668
Undistributed	-----	16	-----	32	-----	17	-----	2
Total Iowa	-----	31,023	-----	35,955	-----	37,458	-----	41,773
Clays sold or used for cement ... thousand short tons	248	124	267	138	266	138	283	213

KANSAS

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Cement [12] ... thousands of 376-pound barrels	7,208	13,017	7,931	16,188	7,641	16,880	8,759	19,400
Clays (except for cement) ... thousand short tons	269	243	289	240	302	260	352	321
Coal ... do	2,745	9,165	2,538	9,654	2,031	7,968	[2] 2,125	[2] 8,234
Lead (recoverable content of ores, etc.) ... short tons	7,285	2,098	8,386	3,002	9,772	3,088	9,487	2,561
Natural gas ... million cubic feet	209,321	10,598	245,189	12,235	[5] 294,078	[5] 15,910	[2] 364,024	[2] 24,026
Natural-gas liquids:								
Natural gasoline ... thousands of 42-gallon barrels	1,704	3,827	1,847	6,561	[5] 1,880	[5] 4,772	[2] 2,572	[2] 6,146
LP-gases ... do	658	978	714	1,716	[5] 768	[5] 1,164	[2] 1,115	[2] 1,487
Petroleum (crude) ... do	105,132	202,900	110,908	288,360	101,868	262,820	[2] 107,586	[2] 276,500
Salt (common) ... thousand short tons	904	4,535	832	4,961	[5] 832	[5] 5,218	846	5,915
Sand and gravel ... do	4,352	2,331	5,083	2,749	6,187	3,328	9,781	6,782
Stone (except limestone for cement) ... do	4,793	4,868	5,316	5,481	[9] 5,978	[9] 7,952	7,630	8,920
Zinc (recoverable content of ores, etc) ... short tons	41,497	10,042	35,577	9,464	29,433	7,300	27,176	7,718
Undistributed: Natural cement, gypsum, pumice and pumicite, and stone (dimension sandstone, 1949)	-----	459	-----	549	-----	502	-----	604
Total Kansas	-----	265,061	-----	361,160	-----	[5] 337,162	-----	368,614
Clays sold or used for cement ... thousand short tons	267	134	298	205	311	214	374	280

KENTUCKY

Clays (except for cement) .... thousand short tons	731	3,278	748	3,483	571	2,903	661	3,553
Coal .... do	84,241	372,128	82,084	444,359	62,583	315,472	[2] 78,496	[2] 393,637
Fluorspar .... short tons	90,256	2,714	84,889	2,663	63,438	2,018	80,137	2,555
Lead (recoverable content of ores, etc.) .... do	214	62	216	77	187	59	66	18
Natural gas .... million cubic feet	96,459	14,430	70,095	12,897	[5] 51,851	[5] 9,888	[2] 73,316	[2] 14,443
Natural-gas liquids:								
Natural gasoline .... thousands of 42-gallon barrels	228	656	239	938	[5] 202	[5] 595	[2] 244	[2] 687
LP-gases .... do	1,194	1,304	1,327	1,683	[5] 1,419	[5] 1,591	[2] 1,535	[2] 1,658
Petroleum (crude) .... do	9,397	19,830	8,801	24,380	[5] 8,803	[5] 24,300	[2] 10,381	[2] 28,650
Sand and gravel .... thousand short tons	2,454	1,997	2,067	2,069	2,376	2,169	2,383	2,263
Stone (except limestone for cement) .... do	[9] 4,990	[9] 5,876	6,155	7,598	7,100	8,586	[9] 7,417	[9] 8,866
Zinc (recoverable content of ores, etc.) .... short tons	508	123	639	170	935	232	731	207
Undistributed: Native asphalt, cement, and stone (dimension limestone, 1947; crushed sandstone, 1950)	--------	3,703	--------	3,763	--------	4,416	--------	3,419
Total Kentucky	--------	426,101	--------	504,080	--------	[5] 372,229	--------	459,956
Clays sold or used for cement .... thousand short tons	56	28	54	27	53	26	58	43
Iron, pig .... do	662	(10)	799	(10)	627	(10)	754	(10)

LOUISIANA

Clays (except for cement) .... thousand short tons	144	118	158	127	134	107	209	185
Natural gas .... million cubic feet	581,398	21,221	686,061	26,482	[5] 732,845	[5] 32,025	[2] 831,771	[2] 44,084
Natural-gas liquids:								
Natural gasoline and cycle products .... thousands of 42-gallon barrels	11,470	26,777	12,562	46,553	[5] 13,936	[5] 45,259	[2] 14,603	[2] 44,548
LP-gases .... do	3,502	7,090	4,339	11,346	[5] 5,318	[5] 9,573	[2] 6,165	[2] 7,991
Petroleum (crude) .... do	160,128	321,130	181,458	485,950	[5] 190,826	[5] 507,730	[2] 208,965	[2] 554,520
Salt (common) .... thousand short tons	1,955	5,899	2,223	6,445	2,030	5,838	2,279	6,903
Sand and gravel .... do	[8] 4,056	[8] 4,277	[8] 4,319	[8] 5,204	[8] 5,050	[8] 6,107	5,505	6,310
Stone (except limestone for cement) .... do	892	827	(3)	(3)	(3)	(3)	(3)	(3)
Sulfur (Frasch-process) .... long tons	862,278	14,659	1,005,711	18,100	1,111,115	20,000	1,256,026	23,700
Undistributed: Cement, gypsum (1950), noncommercial sand and gravel (1947–49), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	--------	2,781	--------	3,991	--------	5,174	--------	5,366
Total Louisiana	--------	404,779	--------	604,198	--------	[5] 631,813	--------	693,607
Clays sold or used for cement .... thousand short tons	71	35	91	68	116	87	118	88

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

MAINE

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Cement thousands of 376-pound barrels	955	1,970	1,176	2,755	1,057	2,526	1,127	2,705
Clays (except for cement) thousand short tons	20	18	27	24	28	25	32	26
Columbium (niobium) concentrate pounds, gross weight			100	(3)				
Feldspar (crude) long tons	16,898	98	18,774	130	18,286	130	17,487	125
Mica:								
Scrap short tons	18	(4)	(3)	(3)	45	1	23	1
Sheet pounds	4,393	1					(3)	(3)
Peat short tons	2,647	73	1,100	30	3,312	79	2,912	62
Sand and gravel thousand short tons	3,777	1,241	[8] 496	[8] 287	4,605	1,394	4,897	1,726
Stone (except limestone for cement and lime) do	[9] 158	[9] 1,558	289	2,021	259	2,026	[9] 310	[9] 2,214
Undistributed: Beryllium concentrate, gem stones, lime, lithium minerals (1948 and 1950), quartz from pegmatites and quartzite (1950), sand and gravel (noncommercial, 1948), slate, stone (unclassified, 1947; and crushed sandstone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		825		2,847		561		602
Total Maine		5,784		8,094		6,742		7,461
Clays sold or used for cement thousand short tons	1	1						

MARYLAND

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Clays (except for cement) thousand short tons	537	876	521	920	586	923	676	1,158
Coal do	2,051	9,837	1,661	8,734	668	3,505	[2] 648	[2] 3,135
Gold (recoverable content of ores, etc.) troy ounces							20	1
Lime (open-market) short tons	71,892	673	69,032	655	64,299	618	64,687	692
Natural gas million cubic feet							[2] 373	[2] 74
Sand and gravel thousand short tons	4,624	4,793	5,834	6,158	[8] 4,777	[8] 6,029	[8] 5,864	[8] 7,790
Stone (except limestone for cement and lime) do	[9] 1,553	[9] 2,416	1,874	3,115	[9] 1,790	[9] 3,036	1,976	3,459
Undistributed: Cement, feldspar (1947), potassium salts, quartz (1947–49), noncommercial sand and gravel (1949–50), slate, stone (crushed, unclassified, 1947; dimension granite, 1949), and talc and ground soapstone		4,696		5,420		6,350		6,416
Total Maryland		23,291		25,002		20,461		22,725
Clays sold or used for cement thousand short tons	65	33	69	52	67	50	66	49
Coke do	1,975	(10)	2,148	(10)	2,040	(10)	2,367	(10)
Iron, pig do	2,408	(10)	2,806	(10)	2,932	(10)	3,525	(10)

MASSACHUSETTS								
Clays ..... thousand short tons	132	111	137	113	156	136	155	139
Lime (open-market) ..... short tons	113,420	1,277	112,271	1,302	107,931	1,360	139,357	1,831
Peat ..... do	820	11	441	6	595	7	650	7
Quartz from pegmatites and quartzite ..... do	1,019	9	792	7	577	4	2,145	24
Sand and gravel ..... thousand short tons	4,943	3,512	5,500	4,418	5,505	4,379	7,111	5,431
Sand and sandstone (ground) ..... short tons	1,944	11	2,150	14	1,514	10	1,829	10
Stone (except limestone for lime) ..... thousand short tons	[9] 2,566	[9] 5,645	[9] 2,367	[9] 6,593	2,291	6,553	[9] 3,284	[9] 8,485
Undistributed	---	(4)	---	130	---	---	---	87
Total Massachusetts	---	10,576	---	12,583	---	12,449	---	16,014
Coke ..... thousand short tons	1,196	(10)	1,057	(10)	891	(10)	855	(10)
Iron, pig ..... do	204	(10)	141	(10)	125	(10)	182	(10)
MICHIGAN								
Bromine ..... thousand pounds	18,803	5,055	17,666	5,436	28,035	7,023	(3)	(3)
Cement ..... thousands of 376-pound barrels	10,471	18,868	11,117	23,533	12,748	28,823	12,854	29,620
Clays (except for cement) ..... thousand short tons	375	343	407	372	369	333	416	381
Coal ..... do	14	108	13	90	11	116	[2] 12	[2] 116
Copper (recoverable content of ores, etc.) ..... short tons	24,184	10,157	27,777	12,055	19,506	7,686	25,608	10,653
Gypsum (crude) ..... do	1,031,157	2,761	1,309,331	3,618	1,264,511	3,470	1,474,210	4,091
Iron ore (usable) ..... thousand long tons, gross weight	12,965	46,783	12,896	53,247	10,993	55,237	12,821	72,359
Magnesium compounds from well brines (partly estimated) short tons, MgO equivalent	31,700	3,034	34,500	3,577	23,700	2,719	34,000	3,871
Manganiferous ore (5 to 35 percent Mn) ..... short tons, gross weight	---	---	---	---	---	---	117,619	(3)
Marl, calcareous (except for cement) ..... short tons	4,050	3	---	---	1,500	2	218,429	122
Natural gas ..... million cubic feet	18,812	2,386	14,981	2,195	[5] 14,753	[5] 2,242	[2] 11,250	[2] 1,485
Natural-gas liquids:								
Natural gasoline ..... thousands of 42-gallon barrels	87	248	60	246	[5] 86	[5] 196	[2] 79	[2] 161
LP-gases ..... do	15	17	1	3	---	---	---	---
Peat ..... short tons	5,013	60	12,425	154	(3)	(3)	12,750	174
Petroleum (crude) ..... thousands of 42-gallon barrels	16,215	34,540	16,871	48,250	[5] 16,517	[5] 45,420	[2] 15,826	[2] 42,730
Salt (common) ..... thousand short tons	4,447	15,043	4,388	16,266	4,064	[5] 16,109	4,447	18,179
Sand and gravel ..... do	16,845	10,758	20,671	14,072	20,476	13,993	24,557	16,699
Silver (recoverable content of ores, etc.) ..... thousand troy ounces	3	3	---	---	---	---	---	---
Stone (except limestone for cement and lime) ..... thousand short tons	18,600	12,601	[9] 19,704	[9] 14,620	16,547	13,387	19,096	15,391
Undistributed: Calcium-magnesium chloride, lime, potassium salts, stone (basalt, 1948), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	---	3,866	---	5,151	---	4,504	---	13,830
Total Michigan	---	166,634	---	202,885	---	[5] 201,260	---	229,862
Clays sold or used for cement ..... thousand short tons	807	522	901	613	993	678	1,012	759
Coke ..... do	2,819	32,407	2,850	39,638	2,484	34,773	2,731	39,192
Iron, pig ..... do	1,388	(10)	1,535	(10)	1,542	(10)	2,157	(10)

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

MINNESOTA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays thousand short tons	148	143	133	152	134	153	129	151
Gem stones (estimated)	(13)	5	(13)	5	(13)	5	-----------	-----------
Iron ore (usable) thousand long tons, gross weight	62,436	203,614	67,923	249,523	55,944	239,859	64,539	311,716
Manganiferous ore (5 to 35 percent Mn) short tons, gross weight	1,044,961	2,739	1,198,523	(3)	990,202	(3)	869,838	(3)
Marl, calcareous (except for cement) short tons	10,100	10	11,262	9	8,840	7	19,375	8
Peat do	7,000	36	3,000	13	12,820	54	400	13
Sand and gravel thousand short tons	13,510	4,194	13,723	4,819	12,935	4,904	15,473	5,903
Stone (except limestone for cement and lime) do	[9] 1,372	[9] 3,855	1,805	5,091	1,879	5,279	[9] 1,953	[9] 5,334
Undistributed: Abrasive stones, cement, lime, stone (basalt, 1947; crushed sandstone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----------	3,778	-----------	7,636	-----------	7,279	-----------	8,442
Total Minnesota	-----------	218,374	-----------	267,248	-----------	257,540	-----------	331,567
Coke thousand short tons	898	10,367	846	12,426	782	12,694	834	13,030
Iron, pig do	546	(10)	557	(10)	455	(10)	652	(10)

MISSISSIPPI

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays thousand short tons	384	1,068	453	1,416	508	1,654	562	2,184
Fuller's earth do	(3)	(3)	(10)					
Natural gas million cubic feet	40,037	1,989	59,899	3,336	[5] 68,062	[5] 4,199	[2] 114,153	[2] 7,192
Natural-gas liquids:								
Natural gasoline and cycle products thousands of 42-gallon barrels	398	915	692	1,815	[5] 776	[5] 2,264	[2] 780	[2] 2,274
LP-gases do	76	159	432	922	[5] 495	[5] 572	[2] 532	[2] 864
Petroleum (crude) do	34,925	61,470	45,761	110,280	37,966	93,400	[2] 38,236	[2] 88,330
Sand and gravel thousand short tons	[8] 2,036	[8] 1,393	2,879	1,520	[8] 1,943	[8] 1,330	2,764	1,986
Stone do	(3)	(3)	24	28	(3)	(3)	100	115
Undistributed: Sand and gravel (noncommercial, 1947 and 1949), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----------	650	-----------	-----------	-----------	292	-----------	-----------
Total Mississippi	-----------	67,644	-----------	119,317	-----------	[5] 103,711	-----------	102,945

MISSOURI

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Barite (crude) short tons	291,619	2,405	278,071	2,414	186,891	1,498	212,736	1,924
Cement thousands of 376-pound barrels	8,031	15,066	8,428	17,911	8,519	19,348	9,780	22,751
Clays (except for cement) thousand short tons	1,427	3,877	1,801	5,061	1,469	3,963	1,533	4,329

232294—53——5

Coal ....do	4, 236	14, 094	4, 022	15, 688	3, 647	14, 919	[2] 2, 963	[2] 12, 369
Copper (recoverable content of ores, etc.) ....short tons	1, 760	739	2, 370	1, 029	3, 670	1, 446	2, 982	1, 240
Iron ore (usable) ....thousand long tons, gross weight	171	(3)	165	(3)	145	(3)	194	(3)
Lead (recoverable content of ores, etc.) ....short tons	132, 246	38. 087	102, 288	36, 619	127, 522	40, 297	134, 626	36, 349
Lime (open-market) ....do	889, 090	7, 006	1, 009, 993	8, 999	878, 561	8, 035	1, 035, 176	9, 448
Natural gas ....million cubic feet	38	5	27	5	[5] 24	4	[2] 21	[2] 3
Petroleum (crude) ....thousands of 42-gallon barrels	55	(3)	31	(3)	[5] 49	(3)	[2] 32	(3)
Sand and gravel ....thousand short tons	[8] 4, 597	[8] 4, 194	4, 887	4, 198	5, 194	4, 347	6, 232	5, 268
Silver (recoverable content of ores, etc.) ....thousand troy ounces	94	85	114	103	123	112	236	214
Stone (except limestone for cement and lime) ....thousand short tons	[9] 8, 438	[9] 11, 196	[9] 9, 021	[9] 12, 320	9, 563	13, 969	10, 300	14, 407
Tripoli ....short tons	19, 375	470	(3)	(3)	15, 888	506	(3)	(3)
Tungsten concentrate ....short tons, 60-percent WO_3 basis	----------	----------	4	(3)	2	(3)	(6)	(3)
Zinc (recoverable content of ores, etc.) ....short tons	17, 074	4, 132	6, 463	1, 719	5, 911	1, 466	8, 189	2, 326
Undistributed: Native asphalt, cobalt (1947), sand and gravel (noncommercial, 1947), ground sand and sandstone, stone (sandstone, 1947–48), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	2, 572	----------	2, 225	----------	1, 383	----------	2, 563
Total Missouri	----------	103, 928	----------	108, 291	----------	[5] 111, 293	----------	113, 191
Clays sold or used for cement ....thousand short tons	317	174	334	249	352	251	414	327

MONTANA

Clays ....thousand short tons	68	156	55	150	54	124	38	38
Coal:								
Bituminous ....do	3, 139	6, 395	2, 860	6, 306	2, 721	6, 161	[2] 2, 468	[2] 5, 686
Lignite ....do	39	112	38	124	45	151	[2] 52	[2] 175
Copper (recoverable content of ores, etc.) ....short tons	57, 900	24, 318	58, 252	25, 281	56, 611	22, 305	54, 478	22, 663
Fluorspar ....do	----------	----------	318	(3)	422	(3)	41	(3)
Gold (recoverable content of ores, etc.) ....troy ounces	90, 124	3, 155	73, 091	2, 558	52, 724	1, 845	51, 764	1, 812
Lead (recoverable content of ores, etc.) ....short tons	16, 108	4, 639	18, 411	6, 591	17, 996	5, 687	19, 617	5, 297
Manganese ore (35 percent or more Mn) ....short tons, gross weight	129, 689	4, 153	130, 184	4, 362	122, 382	5, 068	131, 201	(3)
Manganiferous ore (5 to 35 percent Mn) ....do	3, 671	(3)	4, 135	(3)	5, 517	(3)	6, 810	(3)
Natural gas ....million cubic feet	34, 282	1, 560	36, 551	1, 696	[5] 35, 291	[5] 1, 962	[2] 39, 186	[2] 2, 077
Natural-gas liquids:								
Natural gasoline ....thousands of 42-gallon barrels	66	216	81	370	[5] 86	[5] 210	[2] 98	[2] 350
LP-gases ....do	71	208	120	350	[5] 144	[5] 431	[2] 153	[2] 450
Petroleum (crude) ....do	8, 742	16, 960	9, 382	24, 210	[5] 9, 118	[5] 23, 520	[2] 8, 109	[2] 20, 430
Phosphate ....thousand long tons	236	1, 571	249	1, 720	355	2, 574	210	1, 496
Pumice and pumicite ....short tons	2, 035	10	(3)	(3)	----------	----------	(3)	(3)
Sand and gravel ....thousand short tons	4, 204	3, 130	7, 384	3, 257	6, 682	3, 366	9, 044	5, 140
Silver (recoverable content of ores, etc.) ....thousand troy ounces	6, 326	5, 725	6, 931	6, 273	6, 327	5, 726	6, 591	5, 965
Stone (except limestone for cement and lime) ....thousand short tons	633	575	615	613	[9] 603	[9] 564	919	949
Tungsten concentrate ....short tons, 60-percent WO_3 basis	4	(3)	28	(3)	9	(3)	----------	----------
Zinc (recoverable content of ores, etc.) ....short tons	45, 679	11, 054	59, 095	15, 719	54, 195	13, 440	67, 678	19, 221
Undistributed: Cement, gem stones, gypsum, lime, pyrites, stone (basalt and unclassified, 1949), talc, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	3, 798	----------	4, 261	----------	4, 936	----------	11, 640
Total Montana	----------	87, 735	----------	103, 841	----------	[5] 98, 070	----------	103, 389

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

NEBRASKA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays (except for cement) ... thousand short tons	84	81	105	99	87	85	100	109
Natural gas ... million cubic feet							[2] 17	[2] 2
Petroleum (crude) ... thousands of 42-gallon barrels	229	420	215	520	330	730	[2] 1,547	[2] 3,300
Pumice and pumicite ... short tons	4,546	44	4,000	34	4,622	40	(3)	(3)
Sand and gravel ... thousand short tons	3,793	2,135	4,726	2,933	5,115	2,912	5,078	3,168
Stone (except limestone for cement) ... do	220	538	366	707	[9] 505	[9] 841	737	1,042
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		3,486		4,092		5,494		6,401
Total Nebraska		6,704		8,385		10,102		14,022
Clays sold or used for cement ... thousand short tons	15	8	54	31	47	29	54	40

NEVADA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Antimony ore and concentrate ... short tons, gross weight	1,352	34	225	53	280	77	20	(3)
Barite (crude) ... short tons	37,388	261	(3)	(3)	70,576	417	47,608	269
Copper (recoverable content of ores, etc.) ... do	49,603	20,833	45,242	19,635	38,058	14,995	52,569	21,869
Fluorspar ... do	8,042	(3)	9,615	(3)	5,847	(3)	7,577	(3)
Gold (recoverable content of ores, etc.) ... troy ounces	89,063	3,117	111,532	3,904	130,399	4,564	178,447	6,246
Gypsum (crude) ... short tons	526,972	1,377	519,552	1,222	495,229	1,348	604,604	1,614
Iron ore (usable) ... thousand long tons, gross weight	5	(3)	9	(3)	3	(3)	5	(3)
Lead (recoverable content of ores, etc.) ... short tons	7,161	2,062	9,777	3,500	10,626	3,358	9,408	2,540
Manganese ore (35 percent or more Mn) ... short tons, gross weight	67	(3)						
Manganiferous ore (5 to 35 percent Mn) ... do	13,117	(3)	8,707	(3)	4,964	53	8,942	102
Mercury ... 76-pound flasks	3,881	325	1,206	92	4,170	331	680	55
Sand and gravel ... thousand short tons	963	1,460	2,249	2,018	1,347	1,212	2,617	2,253
Silver (recoverable content of ores, etc.) ... thousand troy ounces	1,378	1,247	1,790	1,620	1,800	1,629	1,537	1,391
Stone (except limestone for lime) ... thousand short tons	1,692	1,069	555	681	519	669	[9] 274	[9] 270
Sulfur ore for direct agricultural use ... long tons	(3)	(3)	358	7	860	15	867	15
Talc and pinite ... short tons	9,767	176	8,019	108	8,837	147	8,581	171
Tungsten concentrate ... short tons, 60-percent WO_3 basis	2,002	2,674	949	(3)	740	(3)	1,123	(3)
Zinc (recoverable content of ores, etc.) ... short tons	16,970	4,107	20,288	5,396	20,443	5,070	21,606	6,136

Undistributed: Andalusite (1947–49), brucite, clays (including fuller's earth), diatomite, dumortierite (1949), gem stones (1947–49), lime, magnesite, calcareous marl, molybdenum concentrate, perlite, pumice and pumicite (1949–50), salt, stone (crushed limestone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	2, 184	-----	4, 267	-----	3, 487	-----	5, 568
Total Nevada	-----	[5] 40, 926	-----	[5] 42, 503	-----	[5] 37, 372	-----	48, 499
NEW HAMPSHIRE								
Beryllium concentrate ... short tons, gross weight	(3)	(3)	(3)	(3)	(3)	(3)	106	40
Clays ... thousand short tons	29	21	25	19	26	20	23	17
Mica (scrap) ... short tons	403	10	(3)	(3)	(3)	(3)	(3)	(3)
Peat ... do	-----	-----	-----	-----	15	(4)	-----	-----
Sand and gravel ... thousand short tons	[14] 1, 737	[14] 199	2, 482	651	[14] 2, 001	[14] 237	[14] 1, 713	[14] 226
Stone ... do	109	400	88	314	7	381	[9] 16	[9] 384
Undistributed: Abrasive stones, feldspar, mica (1949–50), sand and gravel (commercial, 1947, 1949–50), stone (crushed unclassified, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	624	-----	347	-----	746	-----	1, 044
Total New Hampshire	-----	1, 254	-----	1, 331	-----	1, 384	-----	1, 711
NEW JERSEY								
Clays (except for cement) ... thousand short tons	571	1, 403	600	1, 571	537	1, 314	602	1, 278
Iron ore (usable) ... thousand long tons, gross weight	469	3, 690	436	3, 740	448	4, 469	588	5, 652
Manganiferous residuum ... short tons, gross weight	227, 547	(3)	291, 383	(3)	158, 902	(3)	183, 842	(3)
Marl (greensand) ... short tons	8, 337	433	7, 269	393	6, 128	276	3, 935	304
Peat ... do	21, 640	135	23, 102	163	25, 500	181	26, 466	186
Sand and gravel [9] ... thousand short tons	5, 532	6, 335	6, 325	7, 490	5, 555	6, 982	7, 620	8, 636
Sand and sandstone (ground) ... short tons	118, 446	772	116, 832	782	107, 946	755	131, 744	937
Stone (except limestone for lime) ... thousand short tons	3, 858	6, 137	3, 591	6, 376	4, 071	7, 897	[9] 4, 672	[9] 9, 119
Zinc (recoverable content of ore, etc.)[18] ... short tons	76, 871	17, 420	76, 332	20, 710	50, 984	14, 443	55, 029	17, 259
Undistributed: Lime, magnesium compounds, noncommercial sand and gravel, stone (crushed unclassified, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	2, 108	-----	3, 163	-----	2, 267	-----	3, 020
Total New Jersey	-----	38, 433	-----	44, 388	-----	38, 584	-----	46, 391
Clays sold or used for cement ... thousand short tons	(16)	5	-----	-----	-----	-----	-----	-----
Coke ... do	1, 432	(10)	1, 411	(10)	1, 345	(10)	1, 481	(10)

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

NEW MEXICO

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Beryllium concentrate ... short tons, gross weight	(3)	(3)	----	----	8	(3)	(3)	(3)
Carbon dioxide, natural (estimated) ... thousand cubic feet	75,000	30	73,000	29	87,000	35	68,000	27
Clays ... thousand short tons	57	50	50	63	98	69	63	78
Coal ... do	1,443	6,522	1,364	6,947	1,004	5,227	[2] 727	[2] 3,917
Copper (recoverable content of ores, etc.) ... short tons	60,205	25,286	74,687	32,414	55,388	21,823	66,300	27,581
Fluorspar ... do	27,526	841	24,968	912	12,844	446	20,036	742
Gold (recoverable content of ores, etc.) ... troy ounces	3,146	110	3,414	119	3,249	114	3,414	119
Iron ore (usable) ... thousand long tons, gross weight	----	----	----	----	----	----	14	(3)
Lead (recoverable content of ores, etc.) ... short tons	6,383	1,838	7,653	2,740	4,652	1,470	4,150	1,121
Manganese ore (35 percent or more Mn) ... short tons, gross weight	858	(3)	----	----	----	----	1,320	(3)
Manganiferous ore (5 to 35 percent Mn) ... do	97,007	(3)	122,879	(3)	65,511	(3)	74,348	(3)
Natural gas ... million cubic feet	142,740	2,526	194,749	5,258	[5] 204,961	[5] 5,985	[2] 212,909	[2] 6,387
Natural-gas liquids:								
Natural gasoline ... thousands of 42-gallon barrels	2,198	6,026	2,382	9,111	[5] 2,733	[5] 7,728	[2] 3,021	[2] 8,898
LP-gases ... do	494	703	721	1,358	[5] 1,292	[5] 1,462	[2] 1,998	[2] 2,061
Petroleum (crude) ... do	40,926	72,440	47,969	117,520	[5] 47,645	[5] 116,250	[2] 47,367	[2] 115,100
Potassium salts ... short tons, K_2O equivalent	880,605	28,036	967,945	29,177	932,497	27,950	1,072,772	31,944
Pumice and pumicite ... short tons	85,639	512	177,630	813	351,368	1,026	351,642	1,110
Salt (common) ... thousand short tons	12	19	(3)	(3)	(3)	(3)	(3)	(3)
Sand and gravel ... do	541	493	[8] 717	[8] 573	883	611	938	923
Silver (recoverable content of ores, etc.) ... thousand troy ounces	516	467	538	487	381	345	339	306
Stone ... thousand short tons	478	251	531	294	138	106	365	244
Tantalum concentrate ... pounds, gross weight	3,259	9	----	----	----	----	----	----
Zinc (recoverable content of ores, etc.) ... short tons	44,103	10,673	41,502	11,040	29,346	7,278	29,263	8,311
Undistributed: Barite (1949–50), gem stones, gypsum (1948–49), lithium minerals (1947 and 1950), mica (1948 and 1950), molybdenum concentrate, perlite (1948–50), sand and gravel (noncommercial, 1948), vanadium concentrate (1947–48 and 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----	716	----	1,225	----	900	----	1,425
Total New Mexico	----	157,548	----	[5] 220,080	----	[5] 198,825	----	210,294

NEW YORK

Mineral	1947 Quantity	1947 Value	1948 Quantity	1948 Value	1949 Quantity	1949 Value	1950 Quantity	1950 Value
Cement [12] ... thousands of 376-pound barrels	11,593	21,061	12,299	26,071	12,680	28,484	13,271	30,895
Clays (except for cement) ... thousand short tons	904	720	1,162	928	977	769	1,154	939
Emery ... short tons	5,798	67	5,405	69	4,909	61	5,949	75

Gypsum (crude) do	949,375	2,613	1,228,358	3,295	916,117	2,805	1,280,100	3,876
Iron ore (usable) thousand long tons, gross weight	2,514	19,674	2,932	24,385	2,345	22,185	2,917	27,915
Lead (recoverable content of ores, etc.) short tons	1,496	431	1,231	441	1,317	416	1,484	401
Marl, calcareous (except for cement) do	500	3	----------	----------	550	3	(3)	(3)
Natural gas million cubic feet	4,600	1,118	4,705	1,040	[5] 3,693	[5] 907	[2] 3,336	[2] 837
Natural gasoline thousands of 42-gallon barrels	(18)	1	(18)	1	(18)	1	----------	----------
Petroleum (crude) do	4,762	20,050	4,621	22,830	[5] 4,425	[5] 15,750	[2] 4,143	[2] 15,660
Salt (common) thousand short tons	2,923	11,876	3,066	13,057	2,952	[5] 12,710	2,807	14,405
Sand and gravel do	13,820	10,906	16,369	13,382	18,543	15,117	21,778	18,075
Silver (recoverable content of ores, etc.) thousand troy ounces	22	20	19	17	18	17	33	30
Slate short tons	141,780	1,575	125,520	1,533	122,180	1,617	151,160	2,055
Stone (except limestone for cement and lime) thousand short tons	11,198	14,992	12,688	17,261	13,022	18,160	13,122	19,729
Talc short tons	(3)	(3)	119,716	2,614	115,636	2,659	163,974	4,040
Wollastonite do	80	2	75	2	500	7	800	16
Zinc (recoverable content of ores, etc.) do	34,116	8,256	34,566	9,195	37,973	9,417	38,321	10,883
Undistributed: Abrasive stones (1947–48), natural cement, feldspar (1947–49), abrasive garnet, lime, mica sheet (1950), peat (1947), pyrites, titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	8,968	----------	7,502	----------	7,408	----------	6,698
Total New York	----------	122,333	----------	143,623	----------	[5] 138,493	----------	156,529
Clays sold or used for cement thousand short tons	270	135	303	201	308	205	289	217
Coke do	5,670	58,629	5,687	72,757	5,165	69,074	5,412	73,460
Ferro-alloys short tons	346,330	52,912	365,067	66,186	(10)	(10)	(10)	(10)
Iron, pig thousand short tons	3,675	101,205	3,744	122,441	3,244	142,108	4,222	180,158

NORTH CAROLINA

Clays thousand short tons	1,069	1,315	1,205	1,436	1,181	1,336	1,437	1,767
Coal do	----------	----------	----------	----------	14	104	(3)	(3)
Feldspar (crude) long tons	220,997	1,082	201,774	1,117	160,916	974	183,027	1,107
Gold (recoverable content of ores, etc.) troy ounces	----------	----------	----------	----------	13	1	----------	----------
Mica:								
Scrap short tons	38,655	844	44,428	992	24,801	640	48,193	1,281
Sheet pounds	210,816	84	257,926	45	470,072	121	483,736	102
Olivine short tons	7,938	(3)	3,926	(3)	2,458	(3)	4,537	(3)
Sand and gravel thousand short tons	4,172	2,957	4,837	3,522	5,093	3,553	8,352	5,465
Stone do	5,018	7,561	5,237	7,714	6,225	10,078	7,712	11,895
Talc, pyrophyllite and ground soapstone short tons	97,484	1,187	104,052	1,456	86,208	1,345	116,895	1,855
Titanium concentrate (ilmenite) short tons, gross weight	27,199	(3)	28,790	(3)	31,714	(3)	26,542	(3)
Tungsten concentrate short tons, 60-percent WO_3 basis	538	(3)	965	(3)	770	(3)	1,240	(3)
Vermiculite short tons	(3)	(3)	(3)	(3)	(3)	(3)	2,366	67
Undistributed: Abrasive stones, asbestos (1947–48 and 1950), beryllium concentrate (1949), quartz, ground sand and sandstone (1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	1,356	----------	1,949	----------	1,603	----------	2,804
Total North Carolina	----------	16,386	----------	18,231	----------	19,755	----------	26,343

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

NORTH DAKOTA

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Coal (lignite)....thousand short tons..	2,760	5,312	2,961	6,730	2,967	7,004	[2] 3,261	[2] 7,758
Natural gas....million cubic feet..	442	14	643	19	[5] 533	[5] 27	[2] 608	[2] 31
Sand and gravel....thousand short tons..	2,383	920	5,245	1,713	4,371	1,638	4,271	1,660
Stone....do....	----------	----------	(3)	(3)	(3)	(3)	193	136
Undistributed: Nonmetallic minerals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)....	----------	12	----------	16	----------	149	----------	29
Total North Dakota....	----------	6,258	----------	8,478	----------	[5] 8,818	----------	9,614

OHIO

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Cement....thousands of 376-pound barrels..	9,296	16,611	10,020	20,497	10,157	22,389	10,512	24,013
Clays (except for cement)....thousand short tons..	4,229	7,547	4,525	8,024	4,044	7,448	4,498	8,695
Coal....do....	37,548	131,345	38,708	155,129	30,961	123,053	[2] 37,761	[2] 143,853
Lime (open-market)....short tons..	1,774,847	17,685	1,936,211	21,473	1,712,248	20,321	2,142,344	26,273
Natural gas....million cubic feet..	68,946	13,548	65,619	12,901	[5] 46,512	[5] 8,991	[2] 43,163	[2] 8,374
Natural-gas liquids:								
Natural gasoline....thousands of 42-gallon barrels..	165	499	145	629	[5] 123	[5] 432	[2] 103	[2] 344
LP-gases....do....	3	5	5	11	----------	----------	----------	----------
Peat....short tons..	17,754	143	19,207	162	20,372	181	22,145	245
Petroleum (crude)....thousands of 42-gallon barrels..	3,108	10,440	3,600	15,190	[5] 3,483	[5] 10,200	[2] 3,383	[2] 10,250
Salt (common)....thousand short tons..	2,976	6,816	2,753	5,884	2,196	5,135	2,515	5,492
Sand and gravel....do....	15,389	14,195	15,509	15,150	14,956	14,429	15,664	16,209
Stone (except limestone for cement and lime)....do....	[9] 18,711	[9] 23,634	20,275	27,552	[9] 19,364	[9] 27,419	20,466	28,629
Undistributed: Abrasive stones, bromine (1950), calcium-magnesium chloride (1948–50), gypsum, ground sand and sandstone, and stone (unclassified, 1947 and 1949)....	----------	1,976	----------	2,214	----------	2,082	----------	2,195
Total Ohio....	----------	244,444	----------	284,816	----------	[5] 242,080	----------	274,572
Clays sold or used for cement....thousand short tons..	334	167	438	234	466	250	480	360
Coke....do....	10,069	98,974	10,562	128,844	8,911	111,443	10,314	130,017
Ferro-alloys....short tons..	247,035	15,977	259,271	21,853	195,905	18,725	284,229	28,632
Iron, pig....thousand short tons..	12,322	380,383	12,367	469,654	10,524	430,628	12,521	530,708

OKLAHOMA

Clays (except for cement) ---- thousand short tons	224	200	254	227	244	222	316	313
Coal ---- do	3,421	15,102	3,462	16,619	3,022	15,242	[2] 2,679	[2] 14,567
Lead (recoverable content of ores, etc.) ---- short tons	14,289	4,115	16,918	6,057	19,858	6,275	20,724	5,596
Natural gas ---- million cubic feet	419,010	16,509	480,573	23,356	[5] 435,262	[5] 20,327	[2] 482,360	[2] 23,636
Natural-gas liquids:								
Natural gasoline ---- thousands of 42-gallon barrels	6,688	18,690	6,498	26,143	[5] 6,855	[5] 20,360	[2] 7,980	[2] 21,579
LP-gases ---- do	3,943	5,700	4,680	10,963	[5] 5,630	[5] 8,408	[2] 6,753	[2] 8,393
Petroleum (crude) ---- do	141,019	270,760	154,455	398,490	[5] 151,660	[5] 388,250	[2] 164,599	[2] 423,020
Sand and gravel ---- thousand short tons	1,670	1,125	2,005	1,088	2,921	1,526	3,287	2,357
Stone (except limestone for cement and lime) ---- do	2,611	2,680	4,028	4,141	4,342	4,028	5,022	4,848
Zinc (recoverable content of ores, etc.) ---- short tons	51,062	12,357	43,821	11,656	44,033	10,920	46,739	13,274
Undistributed: Native asphalt, cement, gypsum, lime, pumice and pumicite, salt, and ground sand and sandstone (1949–50)	----------	7,149	----------	8,106	----------	8,706	----------	9,512
Total Oklahoma	----------	354,387	----------	506,846	----------	[5] 484,264	----------	527,095
Clays sold or used for cement ---- thousand short tons	299	149	256	163	236	152	240	180

OREGON

Antimony ore and concentrate ---- short tons, gross weight	33	1	----------	----------	54	3	----------	----------
Carbon dioxide, natural (estimated) ---- thousand cubic feet	(19)	50	(19)	50	(19)	50	(3)	(3)
Chromite ---- short tons, gross weight	----------	----------	3,345	(3)	----------	----------	----------	----------
Clays (except for cement) ---- thousand short tons	81	58	111	82	109	90	112	91
Coal ---- do	----------	----------	----------	----------	----------	----------	[2] 1	[2] 8
Copper (recoverable content of ores, etc.) ---- short tons	14	6	2	1	20	8	19	8
Gold (recoverable content of ores, etc.) ---- troy ounces	18,979	664	14,611	511	16,226	568	11,058	387
Lead (recoverable content of ores, etc.) ---- short tons	12	4	7	3	12	4	17	5
Mercury ---- 76-pound flasks	1,185	99	1,351	103	1,167	93	5	(4)
Perlite (crude) ---- short tons	2,130	13	7,937	44	(3)	(3)	17,397	70
Pumice and pumicite ---- do	33,240	111	106,277	307	104,475	273	79,653	321
Sand and gravel ---- thousand short tons	6,020	5,541	8,385	10,629	7,135	7,682	8,200	8,168
Silver (recoverable content of ores, etc.) ---- thousand troy ounces	30	28	14	12	12	11	14	12
Stone (except limestone for cement and lime) ---- thousand short tons	3,002	4,426	3,682	5,734	[9] 4,397	[9] 6,479	[9] 3,837	[9] 5,559
Tungsten concentrate ---- short tons, 60-percent WO_3 basis	----------	----------	----------	----------	3	(3)	----------	----------
Zinc (recoverable content of ores, etc.) ---- short tons	1	(4)	----------	----------	6	1	21	6
Undistributed: Asbestos (1949–50), cement, diatomite, gem stones, lime (1947 and 1950), quartz, stone (dimension granite, 1949; dimension and crushed granite, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	4,864	----------	6,447	----------	6,583	----------	6,907
Total Oregon	----------	[5] 15,865	----------	[5] 23,923	----------	[5] 21,845	----------	21,542
Clays sold or used for cement ---- thousand short tons	60	30	61	46	55	41	51	38

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

PENNSYLVANIA

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Cement .... thousands of 376-pound barrels..	33, 656	60, 998	38, 256	81, 639	36, 905	84, 839	39, 451	94, 604
Clays (except for cement) .... thousand short tons..	3, 172	7, 683	3, 451	8, 605	3, 155	7, 527	3, 301	8, 479
Coal:								
Anthracite .... do....	57, 190	413, 020	57, 140	467, 052	42, 702	358, 008	44, 077	392, 398
Bituminous .... do....	147, 079	622, 833	134, 542	664, 724	89, 215	446, 774	[2] 105, 870	[2] 529, 462
Cobalt (content of ore) .... pounds..	655, 812	(3)	580, 703	(3)	673, 773	(3)	660, 025	(3)
Gold (recoverable content of ores, etc.) .... troy ounces..	1, 518	53	2, 200	77	1, 645	57	1, 764	62
Iron ore (usable) .... thousand long tons, gross weight..	918	6, 535	1, 122	9, 041	953	9, 324	1, 116	11, 626
Lime (open-market) .... short tons..	1, 045, 566	9, 862	1, 085, 807	11, 320	911, 065	10, 191	1, 086, 451	12, 663
Natural gas .... million cubic feet..	91, 971	21, 816	87, 578	21, 124	[5] 84, 739	[5] 21, 727	[2] 91, 137	[2] 23, 058
Natural-gas liquids:								
Natural gasoline .... thousands of 42-gallon barrels..	296	831	269	1, 116	[5] 228	[5] 683	[2] 232	[2] 702
LP-gases .... do....	14	51	22	67	[5] 17	45	[2] 14	[2] 55
Peat .... short tons..	(3)	(3)	(3)	(3)	6, 663	30	(3)	(3)
Petroleum (crude) .... thousands of 42-gallon barrels..	12, 690	53, 170	12, 667	62, 830	11, 374	[5] 40, 600	[2] 11, 859	[2] 45, 300
Sand and gravel .... thousand short tons..	11, 544	13, 007	12, 423	15, 304	11, 699	14, 398	13, 858	17, 172
Silver (recoverable content of ores, etc.) .... thousand troy ounces..	10	9	14	12	11	10	11	9
Slate .... short tons..	266, 240	4, 318	269, 120	5, 351	228, 170	4, 579	285, 120	5, 546
Stone (except limestone for cement and lime) .... thousand short tons..	[9] 22, 353	[9] 31, 939	23, 172	35, 189	21, 226	34, 856	25, 493	42, 206
Tripoli (rottenstone) .... short tons..	516	10	(3)	(3)	452	10	(3)	(3)
Undistributed: Copper, graphite (1947), mica (1949–50), potassium salts (1949), pyrites, ground sand and sandstone, ground soapstone (1947), stone (dimension basalt, 1947), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	....	2, 682	....	3, 509	....	2, 312	....	2, 870
Total Pennsylvania	....	1, 248, 817	....	1, 386, 960	....	[5] 1, 035, 970	....	1, 186, 212
Clays sold or used for cement .... thousand short tons..	159	174	158	251	156	300	181	337
Coke .... do....	22, 388	222, 057	22, 384	257, 034	[5] 17, 667	[5] 216, 206	21, 526	269, 222
Ferro-alloys .... short tons..	564, 386	79, 956	618, 677	101, 136	464, 564	84, 953	586, 805	128, 259
Iron, pig .... thousand short tons..	17, 587	531, 717	17, 750	651, 137	14, 894	641, 033	18, 300	788, 497
Sulfuric acid (from zinc smelting) .... short tons, 100-percent basis..	256, 347	3, 426	238, 125	3, 363	229, 819	3, 506	308, 718	4, 472

RHODE ISLAND

Sand and gravel .... thousand short tons	[14] 44	[14] 25	633	729	398	379	580	580
Stone .... do	[9] 32	[9] 401	107	537	[9] 75	[9] 451	239	798
Undistributed: Nonmetallic minerals		359		184		99		47
Total Rhode Island		785		1,450		929		1,425

SOUTH CAROLINA

Clays (except for cement) .... thousand short tons	709	3,125	706	3,712	664	3,796	955	4,996
Sand and gravel .... do	601	278	403	199	[8] 287	[8] 145	348	167
Stone .... do	2,208	3,921	2,444	4,543	[9] 2,441	[9] 3,629	[9] 2,558	[9] 3,836
Topaz (industrial) .... short tons	2,294	46	200	4	(3)	(3)		
Undistributed: Nonmetallic minerals		219		427		1,456		2,395
Total South Carolina		7,589		8,885		9,026		11,394
Clays sold or used for cement .... thousand short tons			4	2	35	18	41	31

SOUTH DAKOTA

Beryllium concentrate .... short tons, gross weight	70	12	45	(3)	69	(3)	96	30
Clays (except for cement) .... thousand short tons	197	2,082	169	1,715	151	1,530	206	2,208
Coal (lignite) .... do	15	36	29	86	26	92	(3)	(3)
Feldspar (crude) .... long tons	58,959	284	54,037	271	32,272	157	43,875	249
Gold (recoverable content of ores, etc.) .... troy ounces	407,194	14,252	377,850	13,225	464,650	16,263	567,996	19,880
Lead (recoverable content of ores, etc.) .... short tons	8	2	16	6	4	1		
Mica:								
Scrap .... do	1,499	37	988	29	1,125	31	1,902	25
Sheet .... pounds	188,380	29			8,367	3	13,018	2
Natural gas .... million cubic feet	6	(4)	2	(4)	[5] 1	(4)		
Sand and gravel .... thousand short tons	3,122	1,672	4,687	3,247	5,457	2,315	5,392	2,751
Silver (recoverable content of ores, etc.) .... thousand troy ounces	112	101	95	86	109	99	142	128
Stone (except limestone for cement and lime) .... thousand short tons	886	3,554	763	3,911	[9] 1,024	[9] 4,473	[9] 1,206	[9] 4,861
Tantalum concentrate .... pounds, gross weight			500	(3)				
Zinc (recoverable content of ores, etc.) .... short tons	19	5	29	8				
Undistributed: Cement, gypsum (1947–48), lime, lithium minerals, quartz (1947–48), stone (crushed granite, 1949; crushed unclassified, 1950), tin (1948), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)		1,524		1,743		1,759		2,582
Total South Dakota		23,590		24,327		26,723		32,716
Clays sold or used for cement .... thousand short tons	51	26	58	43	37	28	90	67

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

TENNESSEE

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Barite (crude) short tons	31,476	286	25,818	275	13,376	137	(3)	(3)
Cement thousands of 376-pound barrels	6,101	11,017	6,775	13,667	5,993	12,858	6,663	14,683
Clays (except for cement) thousand short tons	659	2,120	701	2,502	624	2,399	787	3,094
Fuller's earth do	(3)	(3)	(3)	(3)				
Coal do	6,258	29,841	6,483	37,232	4,172	21,895	[2] 5,070	[2] 27,360
Gold (recoverable content of ores, etc.) troy ounces	303	11	156	6	171	6	160	6
Lead (recoverable content of ores, etc.) short tons	22	6	----------	----------	257	81	113	31
Lime (open-market) do	181,039	1,534	163,098	1,443	117,053	1,108	98,232	958
Manganese ore (35 percent or more Mn) short tons, gross weight	39	(3)	37	(3)	175	(3)	133	(3)
Natural gas million cubic feet	80	5	127	12	[5] 83	[5] 8	[2] 132	[2] 13
Petroleum (crude) thousands of 42-gallon barrels	8	(3)	19	(3)	[5] 18	(3)	[2] 12	(3)
Phosphate rock thousand long tons	1,412	7,779	1,308	8,231	1,342	9,066	1,384	10,028
Sand and gravel thousand short tons	3,891	3,806	3,817	4,148	4,056	4,054	4,153	4,411
Silver (recoverable content of ores, etc.) thousand troy ounces	79	72	40	36	42	38	40	36
Stone (except limestone for cement and lime) thousand short tons	6,797	10,617	8,011	12,933	[9] 7,614	[9] 13,027	7,979	13,802
Zinc (recoverable content of ores, etc.) short tons	31,212	7,553	29,524	7,853	29,788	7,387	35,326	10,033
Undistributed: Copper, pyrites, quartz (1947–48), stone (crushed sandstone, 1949), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	5,294	----------	5,261	----------	5,269	----------	5,239
Total Tennessee	----------	79,941	----------	93,599	----------	[5] 77,333	----------	89,694
Clays sold or used for cement thousand short tons	273	136	294	201	284	203	314	236
Coke do	242	(10)	251	(10)	213	(10)	244	(10)
Ferro-alloys short tons	147,704	9,197	144,599	11,072	53,756	3,924	93,482	7,659

Abrasive stone: Pebbles, grinding .... short tons..	(3)	(3)	(3)	(3)	226	3	343	5
Cement .... thousands of 376-pound barrels..	12,349	24,112	13,787	30,353	14,742	33,409	17,282	39,678
Clays (including fuller's earth) [17] .... thousand short tons..	1,127	2,758	1,293	3,121	1,235	3,002	1,454	3,577
Coal (lignite) .... do....	61	59	57	58	49	50	[2] 18	[2] 30
Copper (recoverable content of ores, etc.) .... short tons..	6	3	23	10	24	9	2	1
Fluorspar .... do....	1,019	(3)	906	(3)	1,770	(3)	719	(3)
Gold (recoverable content of ores, etc.) .... troy ounces..	45	2	57	2	40	1	49	2
Gypsum (crude) .... short tons..	831,633	2,000	893,704	2,143	843,292	2,179	1,076,251	2,772
Helium (shipments, calendar years) .... thousand cubic feet..	52,322	501	50,915	610	51,501	689	80,889	1,028
Iron ore (usable) .... thousand long tons, gross weight..	289	(3)	746	(3)	569	(3)	1,189	(3)
Lead (recoverable content of ores, etc.) .... short tons..	78	23	170	61	132	42	129	35
Lime (open-market) .... do....	134,530	1,274	168,738	1,584	173,724	1,739	216,439	2,074
Natural gas .... million cubic feet..	1,992,704	73,331	2,289,923	103,505	[5] 2,588,921	[5] 118,832	[2] 3,126,402	[2] 146,941
Natural-gas liquids:								
Natural gasoline and cycle products .... thousands of 42-gallon barrels..	39,395	109,297	44,634	164,948	[5] 47,327	[5] 138,924	[2] 54,007	[2] 156,786
LP-gases .... do....	23,449	32,724	27,482	57,770	[5] 29,704	[5] 45,108	[2] 39,643	[2] 50,266
Peat .... short tons..	(3)	(3)	1,334	19	1,531	12	977	10
Petroleum (crude) .... thousands of 42-gallon barrels..	820,210	1,597,630	903,498	2,357,400	[5] 744,834	[5] 1,932,050	[2] 829,874	[2] 2,147,160
Salt (common) .... thousand short tons..	1,192	2,090	1,354	1,712	[5] 1,641	[5] 2,420	1,852	2,847
Sand and gravel .... do....	13,199	10,541	15,138	12,811	14,998	13,468	17,972	15,708
Silver (recoverable content of ores, etc.) .... thousand troy ounces..	21	19	3	3	3	2	2	2
Stone (except limestone for cement and lime) .... thousand short tons..	3,786	4,277	[9] 3,844	[9] 4,659	4,158	5,290	[9] 4,893	[9] 5,580
Sulfur:								
Ore for direct agricultural use .... long tons..	2,675	37	(3)	(3)	----------	----------	----------	----------
Frasch-process .... do....	3,965,825	70,541	3,973,201	71,500	3,678,196	66,208	4,248,688	80,300
Zinc (recoverable content of ores, etc.) .... short tons..	22	5	----------	----------	----------	----------	----------	----------
Undistributed: Native asphalt, bromine, feldspar (1947 and 1949–50), gem stones, graphite, magnesite (1947 and 1949), magnesium chloride (for metal), magnesium compounds (except for metal, 1947–49), pumice and pumicite, ground sand and sandstone (1948), ground soapstone, sodium sulfate, stone (basalt, 1948; crushed basalt and dimension granite, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----------	14,410	----------	18,014	----------	16,356	----------	19,148
Total Texas	----------	1,945,634	----------	2,830,283	----------	[5] 2,379,793	----------	2,673,950
Clays sold or used for cement .... thousand short tons..	362	181	390	222	496	278	585	439
Coke .... do....	263	(10)	644	(10)	497	(10)	686	(10)
Magnesium metal .... short tons..	5,264	(10)	8,489	3,480	12,977	5,321	15,726	8,879

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

UTAH

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Asphalt and related bitumens, native:								
Gilsonite .... short tons	67,165	1,746	52,122	1,391	51,462	1,304	66,186	1,774
Wurtzilite .... do	17	1	------	------	------	------	------	------
Carbon dioxide, natural (estimated) .... thousand cubic feet	183,000	73	156,000	62	94,000	38	104,334	42
Clays (except for cement) .... thousand short tons	143	278	131	245	222	624	294	930
Fuller's earth .... do	(3)	(3)	(3)	(3)				
Coal .... do	7,429	29,212	6,813	31,062	6,160	29,357	[2] 6,670	[2] 32,050
Copper (recoverable content of ores, etc.) .... short tons	266,533	111,944	227,007	98,521	197,245	77,715	278,630	115,910
Fluorspar .... do	1,730	32	9,523	195	8,332	180	18,936	338
Gold (recoverable content of ores, etc.) .... troy ounces	421,662	14,758	368,422	12,895	314,058	10,992	457,551	16,014
Iron ore (usable) .... thousand long tons, gross weight	2,821	2,861	3,233	3,926	2,699	4,404	3,111	5,747
Lead (recoverable content of ores, etc.) .... short tons	49,698	14,313	55,950	20,030	53,072	16,771	44,753	12,083
Lime (open-market) .... do	47,096	366	40,635	353	36,082	356	49,419	457
Manganese ore (35 percent or more Mn) .... short tons, gross weight	------	------	------	------	------	------	120	(3)
Manganiferous ore (5 to 35 percent Mn) .... do	7,198	(3)	2,694	(3)	4,981	40	3,041	(3)
Natural gas .... million cubic feet	6,040	324	6,610	397	[5] 6,126	[5] 368	[2] 3,950	[2] 237
Natural gasoline .... thousands of 42-gallon barrels	16	47	14	61	[5] 10	[5] 36	[2] 6	[2] 20
Perlite (crude) .... short tons	------	------	414	2	731	3	2,585	13
Petroleum (crude) .... thousands of 42-gallon barrels	------	------	16	(3)	[5] 637	(3)	[2] 1,228	(3)
Pumice and pumicite .... short tons	7,500	30	7,618	30	(3)	(3)	8,719	11
Salt (common) .... thousand short tons	113	340	114	430	79	387	117	512
Sand and gravel .... do	2,946	1,612	2,278	1,369	2,332	1,553	3,435	2,252
Silver (recoverable content of ores, etc.) .... thousand troy ounces	7,780	7,041	8,045	7,281	6,725	6,086	7,084	6,411
Stone (except limestone for cement and lime) .... thousand short tons	[9] 179	[9] 368	280	478	283	427	929	881
Tungsten concentrate .... short tons, 60-percent WO_3 basis	1	(3)	3	(3)	1	(3)	------	------
Vanadium (content of ore and concentrate) .... pounds	48,949	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Zinc (recoverable content of ores, etc.) .... short tons	43,673	10,569	41,490	11,036	40,670	10,086	31,678	8,997
Undistributed: Native asphalt (bituminous sandstone), cement, diatomite (1950), gem stones (1947–49), gypsum, molybdenum concentrate, phosphate rock (1947–48 and 1950), potassium salts, quartz crystal (1950), stone (crushed sandstone, 1947), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	------	10,100	------	14,695	------	17,098	------	25,277
Total Utah	------	206,015	------	[5] 204,459	------	[5] 177,825	------	229,956
Clays sold or used for cement .... thousand short tons	39	19	37	28	30	22	9	7
Coke .... do	1,043	(10)	1,247	(10)	[5] 1,035	(10)	1,226	(10)

VERMONT

Gold (recoverable content of ores, etc.) ... troy ounces	100	4	104	4	120	4	146	5
Lime (open-market) ... short tons	(3)	(3)	22, 743	308	28, 914	356	32, 843	416
Sand and gravel ... thousand short tons	780	562	732	619	1, 582	729	1, 041	662
Silver (recoverable content of ores, etc.) ... thousand troy ounces	21	19	25	22	27	25	28	25
Slate ... short tons	(3)	(3)	192, 940	3, 632	184, 040	3, 624	238, 740	4, 472
Stone (except limestone for lime) ... thousand short tons	392	7, 652	395	7, 992	442	8, 276	447	8, 039
Talc ... short tons	77, 327	1, 000	70, 922	1, 015	64, 508	788	72, 135	906
Undistributed: Asbestos, clays, copper, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	5, 480	-----	2, 407	-----	3, 582	-----	4, 038
Total Vermont	-----	14, 717	-----	15, 999	-----	17, 384	-----	18, 563

VIRGINIA

Clays (except for cement) ... thousand short tons	374	366	444	427	449	404	546	520
Coal ... do	20, 171	97, 406	17, 999	108, 094	14, 584	82, 367	[2] 17, 667	[2] 96, 965
Copper (recoverable content of ores, etc.) ... short tons	5	2	-----	-----	-----	-----	-----	-----
Feldspar (crude) ... long tons	41, 820	262	34, 770	232	33, 936	234	26, 879	188
Iron ore (usable) ... thousand long tons, gross weight	7	(3)	3	(3)	4	(3)	5	(3)
Lead (recoverable content of ores, etc.) ... short tons	3, 803	1, 095	4, 703	1, 684	3, 313	1, 047	3, 254	878
Lime (open-market) ... do	260, 663	2, 139	382, 734	3, 271	349, 132	3, 214	428, 339	3, 862
Manganese ore (35 percent or more Mn) ... short tons, gross weight	-----	-----	427	(3)	224	(3)	56	(3)
Manganiferous ore (5 to 35 percent Mn) ... do	6, 208	(3)	2, 462	(3)	1, 279	(3)	-----	-----
Marl, calcareous (except for cement) ... short tons	98, 970	121	53, 597	65	62, 482	117	52, 181	54
Natural gas ... million cubic feet	64	6	74	7	[5] 65	[5] 5	[2] 46	[2] 4
Petroleum (crude) ... thousands of 42-gallon barrels	61	(3)	33	(3)	43	(3)	[2] 21	(3)
Sand and gravel ... thousand short tons	4, 571	3, 852	4, 099	3, 838	4, 413	4, 049	4, 374	4, 145
Stone (except limestone for cement and lime) ... do	8, 359	12, 377	7, 367	12, 157	7, 510	12, 443	9, 273	16, 435
Zinc (recoverable content of ores, etc.) ... short tons	16, 788	4, 063	15, 882	4, 225	13, 166	3, 265	12, 396	3, 520
Undistributed: Abrasive stone (millstones), aplite, cement, gypsum, kyanite, mica, (1947 and 1949–50), phosphate rock, (1947 and 1949), pyrites, salt, ground sand and sandstone, slate, talc and ground soapstone, titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	-----	8, 607	-----	9, 333	-----	9, 263	-----	11, 235
Total Virginia	-----	130, 296	-----	143, 333	-----	[5] 116, 408	-----	137, 806
Clays sold or used for cement ... thousand short tons	69	35	74	44	92	52	135	102
Coke ... do	212	2, 508	201	2, 887	[5] 158	[5] 2, 300	198	2, 931

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

WASHINGTON

Mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Abrasive stone:								
Pebbles (grinding)...short tons	(3)	(3)	(3)	(3)	20	(4)	25	(4)
Pulpstones...do	76	5	33	2	28	2	33	2
Antimony ore and concentrate...short tons, gross weight	335	26	------	------	14	1	------	------
Carbon dioxide, natural (estimated)...thousand cubic feet	(19)	50	(19)	50	(19)	50	(3)	(3)
Clays (except for cement)...thousand short tons	192	216	234	262	220	267	217	252
Coal...do	1,118	6,691	1,220	7,892	899	6,029	[2] 874	[2] 5,829
Copper (recoverable content of ores, etc.)...short tons	2,240	941	5,665	2,459	5,275	2,078	5,057	2,104
Gold (recoverable content of ores, etc.)...troy ounces	34,965	1,224	70,075	2,453	71,994	2,520	92,117	3,224
Iron ore (usable)...thousand long tons, gross weight	2	(3)	5	(3)	------	------	------	------
Lead (recoverable content of ores, etc.)...short tons	5,359	1,543	7,147	2,559	6,417	2,028	10,334	2,790
Olivine...do	2,900	(3)	840	(3)	1,070	(3)	40	(3)
Peat...do	2,425	10	(3)	(3)	(3)	(3)	------	------
Pumice and pumicite...do	26,497	74	26,675	48	8,610	18	11,013	23
Sand and gravel...thousand short tons	8,381	5,701	9,267	6,657	9,216	6,391	10,606	7,435
Sand and sandstone (ground)...short tons	(3)	(3)	6,682	34	(3)	(3)	(3)	(3)
Silver (recoverable content of ores, etc.)...thousand troy ounces	294	266	376	340	358	324	364	329
Stone (except limestone for cement and lime)...thousand short tons	3,865	4,550	5,230	6,382	[9] 3,689	[9] 4,106	4,931	5,735
Zinc (recoverable content of ores, etc.)...short tons	13,800	3,340	12,638	3,362	10,740	2,664	14,807	4,205
Undistributed: Cement, diatomite, epsom salts made from epsomite (1949–50), gem stones, gypsum (1950), lime, magnesite, quartz, stone (dimension, unclassified, 1949), talc, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	------	13,414	------	16,428	------	14,385	------	17,127
Total Washington	------	38,051	------	48,928	------	40,863	------	49,055
Aluminum...short tons	191,330	53,672	232,067	67,411	238,812	76,164	267,107	87,812
Clays sold or used for cement...thousand short tons	50	25	57	32	59	35	67	50

WEST VIRGINIA

Clays (except for cement)....thousand short tons..	504	1,065	539	938	478	759	570	925
Coal....do....	176,157	788,826	168,862	933,606	122,611	649,697	[2] 144,116	[2] 754,370
Lime (open-market)....short tons..	471,914	4,051	490,803	4,610	350,311	3,535	([3])	([3])
Natural gas....million cubic feet..	192,233	29,643	203,681	34,035	[5] 181,176	[5] 29,296	[2] 189,980	[2] 31,917
Natural-gas liquids:								
Natural gasoline....thousands of 42-gallon barrels..	1,246	3,339	1,228	4,866	[5] 997	[5] 2,945	[2] 1,048	[2] 2,899
LP-gases....do....	2,118	2,975	2,409	3,675	[5] 2,763	[5] 3,591	[2] 3,575	[2] 4,195
Petroleum (crude)....do....	2,617	10,210	2,692	12,810	2,839	8,770	[2] 2,808	[2] 9,350
Salt (common)....thousand short tons..	279	1,161	247	1,198	356	1,289	368	1,239
Sand and gravel....do....	3,796	5,783	3,974	6,307	[8] 3,285	[8] 5,491	3,613	6,241
Stone (except limestone for cement and lime)....do....	4,889	6,034	4,930	5,803	4,855	6,960	[9] 5,368	[9] 7,826
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, cement, calcareous marl, sand and gravel (noncommercial, 1949), ground sand and sandstone, stone (dimension limestone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)....	----	4,583	----	4,554	----	5,786	----	10,662
Total West Virginia....	----	857,670	----	1,012,402	----	[5] 718,119	----	829,624
Clays sold or used for cement....thousand short tons..	87	52	52	39	77	58	105	79
Coke....do....	3,200	28,293	3,651	37,892	[5] 3,360	[5] 36,906	3,691	40,765

WISCONSIN

Abrasive stone:								
Pebbles, grinding....short tons..	([3])	([3])	([3])	([3])	([3])	([3])	530	11
Clays (except for cement)....thousand short tons..	81	64	84	68	80	65	80	70
Iron ore (usable)....thousand long tons, gross weight..	1,543	([3])	1,469	([3])	1,406	([3])	1,702	([3])
Lead (recoverable content of ores, etc.)....short tons..	1,166	336	861	308	857	271	532	144
Lime (open-market)....do....	70,233	805	107,648	1,229	107,339	1,255	124,530	1,448
Marl, calcareous (except for cement)....do....	([3])	([3])	10,293	7	18,533	10	22,025	14
Peat....do....	([3])	([3])	([3])	([3])	([3])	([3])	2,293	9
Sand and gravel....thousand short tons..	16,335	9,939	18,613	11,370	17,023	10,457	19,117	11,959
Stone (except limestone for cement and lime)....do....	[9] 5,898	[9] 11,670	[9] 7,224	[9] 12,581	7,327	13,636	7,000	14,495
Zinc (recoverable content of ores, etc.)....short tons..	12,224	2,958	7,864	2,092	5,295	1,313	5,722	1,625
Undistributed: Abrasive stone (tube-mill liners), cement, pyrites (1947–48), quartz (1947–49), ground sand and sandstone, stone (basalt, 1947–48), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)....	----	8,719	----	9,453	----	8,871	----	11,918
Total Wisconsin....	----	34,491	----	37,108	----	35,878	----	41,693
Clays sold or used for cement....thousand short tons..	30	17	71	46	79	51	82	62

For footnotes, see end of table.

TABLE 6.—Mineral production in continental United States, 1947–50, by States and individual minerals—Continued

WYOMING

Mineral	1947 Quantity	1947 Value (thousand dollars)	1948 Quantity	1948 Value (thousand dollars)	1949 Quantity	1949 Value (thousand dollars)	1950 Quantity	1950 Value (thousand dollars)
Clays (except for cement) ..... thousand short tons..	274	2,592	401	3,692	370	3,567	413	4,102
Coal ..... do....	8,051	27,139	6,412	23,985	6,001	22,972	[2] 6,348	[2] 24,049
Feldspar (crude) ..... long tons..	18,801	90	16,760	78	(3)	(3)	----	----
Gem stones (estimated)	(13)	(3)	(13)	(3)	(13)	20	(13)	(3)
Gold (recoverable content of ores, etc.) ..... troy ounces..	1,486	52	115	4	389	14	----	----
Gypsum (crude) ..... short tons..	22,643	112	(3)	(3)	(3)	(3)	(3)	(3)
Iron ore (usable) ..... thousand long tons, gross weight..	651	(3)	690	(3)	540	(3)	492	(3)
Natural gas ..... million cubic feet..	45,550	2,273	52,424	3,119	[5] 50,815	[5] 2,820	[2] 62,062	[2] 3,724
Natural-gas liquids:								
Natural gasoline ..... thousands of 42-gallon barrels..	829	2,759	854	3,813	[5] 926	[5] 3,248	[2] 1,058	[2] 3,382
LP-gases ..... do....	381	691	584	1,548	[5] 379	[5] 842	[2] 493	[2] 934
Petroleum (crude) ..... do....	44,772	75,220	55,032	128,230	[5] 47,890	[5] 109,190	[2] 61,631	[2] 133,120
Phosphate rock ..... thousand long tons..	52	291	139	695	(3)	(3)	(3)	(3)
Pumice ..... short tons..	----	----	----	----	----	----	1,460	6
Sand and gravel ..... thousand short tons..	2,268	1,491	2,022	1,508	2,352	1,913	1,938	1,251
Silver (recoverable content of ores, etc.) ..... thousand troy ounces..	(11)	(4)	(11)	(4)	(11)	(4)	----	----
Stone (except limestone for cement) ..... thousand short tons..	1,393	1,497	964	1,266	1,803	2,227	1,841	2,214
Sulfur ore for direct agricultural use ..... long tons..	----	----	----	----	3,112	57	(3)	(3)
Undistributed: Cement, sodium carbonate and sulfate, vermiculite (1947–48 and 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)	----	3,188	----	4,066	----	4,128	----	4,795
Total Wyoming	----	117,395	----	172,004	----	[5] 150,998	----	177,577
Clays sold or used for cement ..... thousand short tons..	(16)	1	----	----	----	----	----	----

1 Excludes puzzolan cement, value for which is included with "Undistributed."
2 Final figure. Supersedes preliminary figure given in commodity chapter.
3 Value included with "Undistributed."
4 Less than $500.
5 Revised figure.
6 Less than 0.5 ton.
7 Sales in 1948 included with 1949.
8 "Commercial." Value of "Noncommercial" included with "Undistributed."
9 Excludes certain stone included with "Undistributed."
10 Bureau of Mines not at liberty to publish.
11 Less than 500 troy ounces.
12 Excludes natural cement, value for which is included with "Undistributed."
13 Weight not recorded.
14 "Noncommercial." Value of "Commercial" included with "Undistributed."
15 Value reported for zinc in New Jersey is estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges are added.
16 Less than 500 short tons.
17 Except clays sold or used for cement.
18 Less than 500 barrels.
19 Quantity not available.

TABLE 7.—Mineral production in Territories of the United States, 1947–50, by individual minerals

Territory and mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Alaska:								
Antimony ore and concentrate……short tons, gross weight..	40	16	68	29	74	31	------	------
Coal……thousand short tons..	361	2, 555	408	2, 789	434	3, 309	[1] 412	[1] 3, 033
Copper (recoverable content of ores, etc.)……short tons..	12	5	16	7	4	2	6	2
Gold (recoverable content of ores, etc.)……troy ounces..	279, 988	9, 800	248, 395	8, 694	229, 416	8, 030	289, 272	10, 125
Lead (recoverable content of ores, etc.)……short tons..	264	76	329	118	51	16	149	40
Mercury……76-pound flasks..	127	11	100	8	100	8	------	------
Platinum-group metals (crude)……troy ounces..	13, 512	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Sand and gravel……thousand short tons..	(2)	(2)	(2)	(2)	(2)	(2)	3, 050	2, 377
Silver (recoverable content of ores, etc.)……thousand troy ounces..	66	60	67	61	36	33	53	48
Stone……thousand short tons..	(2)	(2)	41	54	(2)	(2)	(2)	(2)
Tin (content of ore and concentrate)……long tons..	1	2	5	(2)	51	115	79	170
Tungsten concentrate……short tons, 60-percent WO_3 basis..	13	(2)	------	------	------	------	13	(2)
Zinc (recoverable content of ores, etc.)……short tons..	25	6	22	6	2	(3)	6	2
Undistributed: Clays (1948), gem stones (1947), pumice (1948), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)……	------	5, 957	------	1, 258	------	4, 005	------	2, 055
Total Alaska……	------	18, 488	------	13, 024	------	15, 549	------	17, 852
Hawaii:								
Lime (open-market)……short tons..	9, 130	228	8, 767	237	8, 404	227	8, 141	220
Stone……thousand short tons..	[4] 786	[4] 1, 471	[4] 838	[4] 1, 917	[4] 654	[4] 718	696	1, 555
Undistributed: Other nonmetallic minerals……	------	6	------	17	------	43	------	------
Total Hawaii……	------	1, 705	------	2, 171	------	988	------	1, 775
Total Territories……	------	20, 193	------	15, 195	------	16, 537	------	19, 627

[1] Final figure. Supersedes preliminary figure given in commodity chapter.
[2] Value included with "Undistributed."
[3] Less than $500.
[4] Excludes certain stone included with "Undistributed."

TABLE 8.—Mineral production in possessions and other areas administered by the United States, 1947–50, by individual minerals

Area and mineral	1947		1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Canal Zone:								
Sand and gravel [1][2] ... thousand short tons	45	[3] 68	55	[3] 82	39	[3] 58	22	15
Stone (crushed) [1][2] ... do	102	[3] 152	179	[3] 268	109	[3] 164	53	83
Total Canal Zone		220		350		222		98
Guam: Stone [1][4] ... thousand short tons	1,142	2,285	1,537	3,073	2,605	5,209	[2] 1,528	[2][3] 3,055
Puerto Rico:								
Cement ... thousands of 376-pound barrels	1,904	5,339	2,440	6,947	2,171	6,109	3,187	8,299
Lime (open-market) ... short tons	(5)	(5)	(5)	(5)	7,347	184	8,166	181
Salt (common) ... thousand short tons	13	101	15	112	13	77	14	137
Sand and gravel ... do	(5)	(5)	(5)	(5)	(5)	(5)	101	104
Stone ... do	104	195	[6] 159	[6] 312	[6] 520	[6] 827	[6] 250	[6] 575
Undistributed: Other nonmetallic minerals and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 5)		239		280		139		1
Total Puerto Rico		5,874		7,651		7,336		9,297
Trust Territory of the Pacific Islands (Angaur Island):								
Phosphate rock (exports) ... thousand long tons	106	426	76	380	155	747	[2] 135	[2] 672
Virgin Islands: [7] Stone (crushed) [1][2] ... thousand short tons	(8)	[9] 12	9	[3] 14	10	[3] 16	3	[3] 4
Total		8,817		11,468		13,530		13,126

[1] Quantities are estimated short-ton equivalents of cubic yards reported.
[2] Data for fiscal years ended June 30.
[3] Estimate.
[4] Distribution by years estimated for 1947–49 from reported totals and a partial breakdown.
[5] Included with "Undistributed."
[6] Excludes certain stone included with "Undistributed."
[7] St. Croix Island only. Data for St. Thomas Island not available.
[8] Figure not available.
[9] Conjectural.

Employment and Injuries in the Mineral Industries[1]

By Seth T. Reese

GENERAL SUMMARY

EMPLOYMENT in the mineral industries in 1950 declined to an average daily labor force of 711,947 or approximately 1.6 percent. Mineral plants were worked 20 days more than in 1949. The increased number of working days accounted for the 8-percent gain in total man-hours worked. At mineral plants in 1950, a shift of 7.88 hours was worked by the average employee, the same as in 1949. For a man-year in the industries the average hours worked in 1950 increased 154. Decreases at coal and metal mines and at metallurgical plants largely accounted for the lower rate of operating activity of the industries with respect to employment. Slight increases in employment were made in nonmetal mines and in stone quarries; at coke plants employment was steady.

The injury record of the mineral industries improved slightly in 1950, although 72 more men were killed than during the preceding year and the total nonfatal injuries increased 1,674. In 1949 the frequency rate for all injuries, including fatalities, was 44.71, and in 1950 this rate was 42.86 per million man-hours of exposure. This decrease is accounted for by the 8-percent increase in total man-hours worked. The fatality frequency rate increased 0.01 and the nonfatal rate per million man-hours of exposure decreased 1.86, or slightly over 4 percent. The fatality frequency rate (0.66) was the second lowest since complete injury data were made available in 1930, and the nonfatal rate of 42.20 was lower than in any year for which injury statistics are available.

For the second straight year there was no major disaster (a single accident in which five or more men are killed), and the record in this respect made in 1949 was continued.

Fatality experience improved in coal mines and stone quarries. At coke plants, metal and nonmetal mines, and metallurgical plants, the trends were reversed. The greatest reversal was at nonmetal mines, where the rate increased 89 percent, considerably more than the increase in man-hours worked.

---

[1] Data on petroleum, natural-gas, sand and gravel, and clay industries and on iron-smelting and steel industries are excluded from this chapter.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1946–50, by industry groups

	1946	1947	1948	1949	1950 [1]
Average number of men working daily: [2]					
Coal mines	463,079	490,356	507,333	485,306	476,800
Metal mines	65,234	71,228	71,436	71,664	69,700
Nonmetal mines (except stone quarries)	11,312	12,176	11,950	12,077	12,100
Stone quarries	70,265	75,245	77,344	82,209	83,000
Coke plants	21,410	23,705	25,157	24,471	24,347
Metallurgical plants	44,954	49,082	47,768	47,663	46,000
Total	676,254	721,792	740,988	723,390	711,947
Average number of active mine-days: [3]					
Coal mines	224	239	227	170	193
Metal mines	249	275	282	252	271
Nonmetal mines (except stone quarries)	291	292	287	277	291
Stone quarries	274	279	284	275	273
Coke plants	337	350	350	321	341
Metallurgical plants	284	313	317	294	315
Total	240	256	249	205	225
Man-days worked, in thousands: [4]					
Coal mines	103,847	117,312	115,083	82,437	92,157
Metal mines	16,238	19,567	20,124	18,067	18,889
Nonmetal mines (except stone quarries)	3,297	3,555	3,432	3,340	3,525
Stone quarries	19,262	20,996	21,993	22,569	22,675
Coke plants	7,205	8,293	8,798	7,860	8,292
Metallurgical plants	12,783	15,353	15,121	14,031	14,480
Total	162,632	185,076	184,551	148,304	160,018
Man-hours worked, in thousands: [4]					
Coal mines	879,628	949,540	898,231	642,476	716,880
Metal mines	130,406	157,024	161,516	144,368	150,860
Nonmetal mines (except stone quarries)	26,877	28,809	27,784	26,948	28,540
Stone quarries	158,528	171,979	179,111	182,258	183,660
Coke plants	57,710	66,119	70,021	62,446	65,861
Metallurgical plants	101,673	122,630	121,028	112,095	116,070
Total	1,354,822	1,496,101	1,457,691	1,170,591	1,261,871
Number of injuries:					
Fatal:					
Coal mines	968	1,158	999	585	642
Metal mines	90	126	104	69	87
Nonmetal mines (except stone quarries)	26	12	15	10	20
Stone quarries	55	75	75	66	42
Coke plants	8	15	20	7	14
Metallurgical plants	20	21	14	23	27
Total	1,167	1,407	1,227	760	832
Nonfatal:					
Coal mines	55,350	57,660	53,472	35,405	37,235
Metal mines	7,345	8,293	7,631	6,940	6,790
Nonmetal mines (except stone quarries)	1,369	1,308	1,176	1,125	1,160
Stone quarries	5,137	5,504	4,994	4,826	4,660
Coke plants	810	926	917	713	780
Metallurgical plants	2,794	3,228	2,749	2,567	2,630
Total	72,805	76,919	70,939	51,576	53,255

[1] Preliminary figures based on an average of 80 percent coverage.
[2] Average number of men at work each day mine was active. Because absenteeism and labor turn-over are taken into consideration, this number is lower than number of men available for work as measured by a count of names on payroll.
[3] Average in which operating time of each mine is weighted by average number of workers in mine.
[4] Totals of man-days and man-hours are additions of the rounded subtotals and may differ slightly from totals obtained before rounding.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1946–50, by industry groups—Continued

	1946	1947	1948	1949	1950 [1]
Injury rates per million man-hours:					
Fatal:					
Coal mines	1.10	1.22	1.11	0.91	0.90
Metal mines	.69	.80	.64	.48	.58
Nonmetal mines (except stone quarries)	.97	.42	.54	.37	.70
Stone quarries	.35	.44	.42	.36	.23
Coke plants	.14	.23	.29	.11	.21
Metallurgical plants	.20	.17	.12	.21	.23
Total	.86	.94	.84	.65	.66
Nonfatal:					
Coal mines	62.92	60.72	59.53	55.11	51.94
Metal mines	56.32	52.81	47.25	48.07	45.01
Nonmetal mines (except stone quarries)	50.94	45.40	42.33	41.75	40.64
Stone quarries	32.40	32.00	27.88	26.48	25.37
Coke plants	14.04	14.01	13.10	11.42	11.84
Metallurgical plants	27.48	26.32	22.71	22.90	22.62
Total	53.74	51.41	48.67	44.06	42.20

[1] Preliminary figures based on an average of 80 percent coverage.

Except at coke plants, the nonfatal injury record improved in all major mineral industries. The greatest improvement was at coal mines, with metal mines a close second.

Work Stoppages.—The mineral industries in 1950 were affected by 531 work stoppages, 38 more than in 1949, and resulted in a loss of 80,000 man-days at anthracite mines, 9,320,000 man-days at bituminous-coal mines, and 235,000 man-days at metal mines. At nonmetal mines and in quarries, 22 work stoppages caused a loss of 64,000 man-days, and the 24 work stoppages at cement mills, coke and coke-byproducts plants, and petroleum refineries resulted in an aggregate loss of 697,000 man-days.

The over-all loss due to work stoppages in all branches of the mineral industries in 1950 totaled 10,396,000 man-days or 46 percent less than in 1949.

Average Earnings.—In each of the mineral industries for which data are published by the Bureau of Labor Statistics the average hourly earnings increased in 1950 compared with 1949, and the average weekly earnings had the same favorable trends. The average weekly earnings were higher in 1950 than in 1949, and, except in anthracite and bituminous-coal mines, they were higher than in 1948.

Labor Turn-Over.—As in 1949, the labor turn-over in the mineral industries was highest in metal mining and lowest in petroleum refining, according to data published by the Bureau of Labor Statistics. Unlike 1949, the separation rates of labor turn-over in 1950 were lower than the accession rates in 1949, except in bituminous-coal mining. The anthracite-mining and petroleum-refining rates remained stable.

TABLE 2.—Work stoppages, average earnings, and labor turn-over in certain mineral industries in the United States, 1948–50

[Bureau of Labor Statistics]

Industry and year	Work stoppages [1]		Average earnings [2]		Labor turn-over rates [3]	
	Number	Man-days lost (thousands)	Weekly	Hourly	Accession	Separation
Coal mining:						
Anthracite:						
1948	26	274	$66.57	$1.809	1.7	1.9
1949	34	1,400	56.78	1.880	1.5	2.1
1950	41	80	63.24	1.970	1.8	1.8
Bituminous:						
1948	561	9,560	72.12	1.898	3.3	3.1
1949	421	16,700	63.28	1.941	2.0	2.9
1950	430	9,320	70.35	2.010	[4] 2.0	[4] 2.5
Metal mining:						
Total:						
1948	11	473	60.80	1.434	4.7	4.5
1949	9	970	61.55	1.505	3.8	4.5
1950	14	235	65.58	1.554	4.6	4.2
Iron:						
1948	(5)	(5)	58.32	1.412	3.1	2.9
1949	(5)	(5)	58.91	1.484	2.1	2.2
1950	(5)	(5)	61.96	1.515	2.6	2.5
Copper:						
1948	(5)	(5)	65.81	1.456	5.9	5.5
1949	(5)	(5)	63.96	1.512	4.8	5.3
1950	(5)	(5)	72.05	1.601	5.3	4.4
Lead-zinc:						
1948	(5)	(5)	61.37	1.486	6.4	6.0
1949	(5)	(5)	64.79	1.565	3.9	5.5
1950	(5)	(5)	66.64	1.602	4.4	3.9
Nonmetal mining and quarrying:						
1948	16	57	55.31	1.243	(5)	(5)
1949	17	166	56.38	1.302	(5)	(5)
1950	22	64	59.88	1.361	(5)	(5)
Cement:						
1948	4	37	54.76	1.307	3.7	3.4
1949	3	37	57.49	1.382	1.7	1.8
1950	12	57	60.13	1.442	2.2	2.1
Coke and byproducts:						
1948	3	11	58.56	1.475	(5)	(5)
1949	3	31	61.07	1.554	(5)	(5)
1950	2	2	62.85	1.583	(5)	(5)
Petroleum refining:						
1948	6	728	72.06	1.788	1.1	.9
1949	6	39	75.33	1.874	.4	1.0
1950	10	638	77.93	1.929	.8	.8

[1] Number of stoppages beginning during each year and man-days of work lost from only these stoppages during the year.
[2] Monthly averages for production and related workers only; data cover both full and part-time employees who worked during, or received pay for, the pay period ended nearest the 15th of the month.
[3] Monthly averages expressed as the number per 100 employees. Accessions are additions to the work force, whether new or rehired employees; separations are terminations of employment, including quits, discharges, lay-offs, and military and miscellaneous separations. Data for metal mining, cement, and petroleum refining for 1950 are not comparable with preceding years, owing to changes in industry classification by the Department of Labor.
[4] An 11-month average owing to strike during February.
[5] Figure not available.

TABLE 3.—Employment and injury experience of the mineral industries of the United States, 1931–50

Year	Men working daily	Average active days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Non-fatal	Fatal	Non-fatal
1931	784, 347	188	147, 602, 799	1, 288, 135, 808	1, 707	94, 021	1. 33	72. 99
1932	671, 343	165	110, 655, 616	962, 924, 915	1, 368	66, 028	1. 42	68. 57
1933	677, 722	181	122, 787, 658	1, 058, 245, 650	1, 242	70, 158	1. 17	66. 30
1934	739, 817	195	144, 566, 133	1, 167, 723, 543	1, 429	79, 211	1. 22	67. 83
1935	783, 139	195	152, 354, 170	1, 215, 316, 764	1, 495	80, 070	1. 23	65. 88
1936	824, 514	216	177, 920, 334	1, 426, 233, 543	1, 686	90, 608	1. 18	63. 53
1937	859, 951	217	186, 790, 283	1, 482, 241, 908	1, 759	94, 466	1. 19	63. 73
1938	774, 894	187	145, 056, 875	1, 144, 137, 296	1, 369	69, 940	1. 20	61. 13
1939	788, 925	202	159, 388, 490	1, 251, 169, 210	1, 334	73, 253	1. 07	58. 55
1940	801, 926	219	175, 663, 792	1, 385, 128, 234	1, 716	80, 856	1. 24	58. 37
1941	835, 095	234	195, 425, 228	1, 541, 335, 277	1, 621	87, 911	1. 05	57. 04
1942	802, 640	260	208, 739, 906	1, 653, 284, 620	1, 862	91, 675	1. 13	55. 45
1943	747, 486	277	207, 350, 643	1, 668, 340, 394	1, 799	88, 449	1. 08	53. 02
1944	676, 938	287	194, 512, 359	1, 618, 479, 042	1, 571	83, 451	. 97	51. 56
1945	637, 220	271	172, 672, 431	1, 437, 533, 530	1, 270	73, 411	. 88	51. 07
1946	676, 254	240	162, 630, 674	1, 354, 822, 190	1, 167	72, 805	. 86	53. 74
1947	721, 792	256	185, 076, 018	1, 496, 101, 097	1, 407	76, 919	. 94	51. 41
1948	740, 988	249	184, 551, 937	1, 457, 690, 518	1, 227	70, 939	. 84	48. 67
1949	723, 390	205	148, 304, 347	1, 170, 590, 880	760	51, 576	. 65	44. 06
1950 (preliminary)	711, 947	225	160, 018, 135	1, 261, 871, 005	832	53, 255	. 66	42. 20

NATIONAL SAFETY COMPETITION

The National Safety Competition, conducted annually by the Bureau of Mines, attained the second lowest injury-severity rate in its 26-year history. The over-all injury experience at the 575 enrolled mineral operations was 5.87 days of disability per thousand man-hours of exposure to hazard and a frequency rate of 33.17 per million man-hours, the second lowest in the history of the competition and only slightly above the all-time record of 33.02 in 1940. Of the enrolled mines and quarries, 177 attained injury-free records. The 575 enrolled mineral operations worked nearly 150 million man-hours. The National Safety Competition is designed to promote safety in the mineral industries of the United States. It provides, at plant level, the opportunity for management and labor to cooperate in a program intended to increase the effectiveness of accident-prevention work in mines and quarries. Trophy awards for the best safety records in each of the six groups of the 1950 competition were made to the following:

Anthracite Underground Mines.—The Birdseye mine of The Hudson Coal Co., Throop, Pa.

Bituminous-Coal Mines.—The Reliance No. 7 mine of The Union Pacific Coal Co., Reliance, Wyo.

Metal Underground Mines.—The Tobin mine of the Republic Steel Corp., Crystal Falls, Mich.

Nonmetal Underground Mines.—The Barberton limestone mine of the Pittsburgh Plate Glass Co., Barberton, Ohio.

Open-Pit Mines.—The Embarrass mine of Pickands Mather & Co. (Lake Mining Co.), Biwabik, Minn.

Quarries.—The Rogers City quarry of the Michigan Limestone & Chemical Co., Rogers City, Mich.

COAL MINES

The safety record at coal mines in the United States in 1950 was better than in any year since 1930, when complete injury data were first available and compiled. The tentative frequency rate—52.84 injuries (fatal and nonfatal) per million man-hours of worker exposure—represented a decrease from 56.02 in 1949 and was 12.3 percent lower than the previous record for the coal industry established in 1944. The frequency rates in both anthracite and bituminous coal contributed to this improved performance.

The total number of fatalities (642) in 1950, which was bettered only by the total number in the preceding year, was the second-lowest annual total for the last 20 years. The total number of nonfatal injuries in 1950 is estimated at 37,235, a 5-percent increase over 1949. However, as exposure time increased about 12 percent in 1950, the over-all safety record (fatal and nonfatal) improved. This is the second calendar year since 1910, when complete disaster records first were made available, that the entire industry operated without a major disaster.

The average number of men working daily at coal mines decreased 2 percent to 476,800 in 1950. The mines were active an average of 193 days, an increase of 23 days compared with 1949. In 1950 the average coal-mining employee worked a 7.78-hour shift and accumulated 1,504 hours of work, 180 hours or 14 percent more than in 1949.

Bituminous-Coal Mines.—In 1950 the safety record of the bituminous-coal industry was better than in any year since 1930, when complete injury records first became available. The tentative rate of 48.76 injuries (fatal and nonfatal) per million man-hours of exposure was 7 percent lower than the 52.60 rate for 1949 and 15 percent less than the previous best record of 57.25 injuries per million man-hours in 1944. The fatality rate of 0.93 was identical with the 1949 rate, the best on record. Thus, in 1950 and for the second time since 1930 the fatality rate was less than 1 per million man-hours of exposure.

The estimated 28,380 nonfatal injuries, although 832 more than the 1949 total, resulted in a 7-percent decline in the frequency rate because of a corresponding percentage increase in man-hours of exposure. The 1950 frequency rate (47.83) was the lowest since 1930, when accurate injury data were first made available.

At bituminous-coal mines 475 fatalities occurred underground, 41 on the surface, and 34 in strip-pit operations. The 475 men killed in underground workings represented a 12-percent increase over the 425 killed in 1949. Falls of roof and face continued to be the leading cause of all underground fatalities and increased by 41 over 1949 to a total of 319. Accidents in underground haulage increased to 105 from 94 in 1949 and were second to roof falls in accident importance. Other underground fatalities in 1950 were charged to the following classifications: Machinery, 14; electricity, 13; explosives, 10; minor gas explosions, 3; and miscellaneous, 11.

Employment at bituminous-coal mines decreased 7,431 to an average of 402,000 men working daily in 1950. The mines were active 187 days, or 22 more than in 1949, and the total man-hours

TABLE 4.—Employment and injury experience at coal mines in the United States, 1946–50

Industry and year	Men working daily	Average active mine-days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Bituminous-coal mines:[1]								
1946	385,142	215	82,849,738	727,994,944	795	42,817	1.09	58.81
1947	411,845	236	97,105,260	803,016,338	985	46,025	1.23	57.32
1948	429,378	220	94,574,820	747,685,733	862	42,078	1.15	56.28
1949	409,431	165	67,551,942	533,165,522	494	27,548	.93	51.67
1950 (preliminary)	402,000	187	75,276,000	593,410,000	550	28,380	.93	47.83
Pennsylvania anthracite mines:								
1946	77,937	269	20,997,263	151,633,250	173	12,533	1.14	82.65
1947	78,511	257	20,206,753	146,523,360	173	11,635	1.18	79.41
1948	77,955	263	20,508,227	150,544,988	137	11,394	.91	75.69
1949	75,875	196	14,885,115	109,310,226	91	7,857	.83	71.88
1950 (preliminary)	74,800	226	16,881,000	123,470,000	92	8,855	.75	71.72
Total coal mines:								
1946	463,079	224	103,847,001	879,628,194	968	55,350	1.10	62.92
1947	490,356	239	117,312,013	949,539,698	1,158	57,660	1.22	60.72
1948	507,333	227	115,083,047	898,230,721	999	53,472	1.11	59.53
1949	485,306	170	82,437,057	642,475.748	585	35,405	.91	55.11
1950 (preliminary)	476,800	193	92,157,000	716,880,000	642	37,235	.90	51.94

[1] Includes lignite.

worked increased slightly over 60,000,000. The average worker had a 7.88-hour shift and accumulated 1,476 work hours in the year, an increase of 174 over 1949.

Anthracite Mines.—The injury experience in Pennsylvania anthracite mines was better in 1950 than in any year since 1930. The tentative frequency rate (fatal and nonfatal) per million man-hours of exposure was 72.47. Although the estimated number of fatalities in 1950 exceeded the 1949 total by one, the frequency rate (0.75) was the lowest on record for the industry. This decreased rate resulted from a 13-percent increase in the total number of man-hours worked in 1950. For the third successive year, there were no major disasters in the anthracite mines. In all, 8,855 nonfatal injuries occurred, at a rate of 71.72 per million man-hours of exposure. This rate was also the lowest attained in the accident-statistics history of the industry.

At anthracite mines 77 men were killed underground, 9 on the surface, and 6 in strip mining. Falls from roof and face caused 58 fatalities, an increase of 4 over 1949. Fatalities from haulage accidents were less by 4, but the number of men killed in minor gas explosions and by explosives, electricity, and miscellaneous causes increased from 7 in 1949 to 11 in 1950. Fatalities in surface works took 4 more lives in 1950 than in 1949, and twice as many strip-pit employees were killed.

The daily average number of men working in the anthracite mines during 1950 declined slightly over 1,000, but the mines were active 30 days more than in 1949. The aggregate worktime in the industry increased to 123,470,000 hours, a gain of 13 percent. A working shift averaged 7.31 hours, and the average employee worked a total of 1,651 hours, 210 hours more than in 1949.

METAL MINES

Injury experience at metal mines during 1950 improved, although there were 18 more fatalities than in 1949. The tentative frequency rate (fatal and nonfatal) was 45.59 per million man-hours of exposure, a 6-percent decline compared with the frequency rate for 1949. The total number of fatalities was greater in each group of mines, except at iron mines, where 21 men were killed in each comparable period. Nonfatal injuries continued to decrease in number, and in 1950 were less than in any of the four preceding years. Improvements at iron and lead-zinc mines and at gold placers more than offset the less favorable experience in other metal-mine groups.

Except at iron mines, the average number of men working daily at metal mines decreased in each group. The aggregate time worked increased 4 percent to 150,860,000 man-hours. This was due primarily to an 8-percent increase in the average number of active mine days

TABLE 5.—Employment and injury experience at metal mines in the United States, 1946–50, by industry groups

Industry and year	Men working daily	Average active mine days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Iron mines:								
1946	24,723	227	5,603,762	45,048,416	25	1,206	0.55	26.77
1947	26,478	273	7,238,851	58,157,587	36	1,403	.62	24.12
1948	27,116	287	7,786,361	62,468,142	34	1,440	.54	23.05
1949	27,792	249	6,907,048	55,422,388	21	1,158	.38	20.89
1950 (preliminary)	27,800	267	7,432,000	59,520,000	21	1,095	.35	18.40
Copper mines:								
1946	12,969	276	3,578,349	28,622,003	23	1,457	.80	50.90
1947	15,654	305	4,782,153	38,263,818	32	1,655	.84	43.25
1948	16,280	305	4,959,483	39,684,197	31	1,572	.78	39.61
1949	16,027	271	4,341,202	34,729,944	13	1,190	.37	34.26
1950 (preliminary)	15,900	300	4,766,000	37,960,000	18	1,215	.47	32.01
Lead-zinc mines:								
1946	15,934	265	4,228,143	33,777,747	30	2,916	.89	86.33
1947	16,628	268	4,457,549	35,618,006	33	3,221	.93	90.43
1948	16,113	264	4,255,190	34,034,255	22	3,050	.65	89.62
1949	16,333	243	3,971,971	31,738,565	24	2,810	.76	88.54
1950 (preliminary)	14,700	262	3,851,000	30,930,000	32	2,585	1.03	83.58
Gold-silver mines:								
1946	5,152	253	1,305,504	10,203,525	8	1,000	.78	98.01
1947	5,537	255	1,414,106	11,063,328	14	1,192	1.27	107.74
1948	5,276	273	1,442,554	11,328,421	13	986	1.15	87.04
1949	5,309	258	1,369,960	10,651,525	9	1,190	.84	111.72
1950 (preliminary)	5,300	263	1,393,000	10,800,000	10	1,300	.93	120.37
Gold placers:								
1946	3,458	212	732,683	6,438,965	1	220	.16	34.17
1947	3,920	212	830,710	7,166,257	3	230	.42	32.09
1948	3,772	230	867,709	7,423,065	1	180	.13	24.25
1949	3,523	216	760,202	6,087,196	-------	187	-------	30.72
1950 (preliminary)	3,400	214	728,000	5,840,000	-------	140	-------	23.97
Miscellaneous:[1]								
1946	2,998	263	789,562	6,315,410	3	546	.48	86.46
1947	3,011	280	843,616	6,755,376	8	592	1.18	87.63
1948	2,879	282	813,035	6,578,055	3	403	.46	61.26
1949	2,680	267	716,405	5,738,514	2	405	.35	70.58
1950 (preliminary)	2,600	277	719,000	5,810,000	6	455	1.03	78.31
Total:								
1946	65,234	249	16,238,003	130,406,066	90	7,345	.69	56.32
1947	71,228	275	19,566,985	157,024,372	126	8,293	.80	52.81
1948	71,436	282	20,124,332	161,516,135	104	7,631	.64	47.25
1949	71,664	252	18,066,788	144,368,132	69	6,940	.48	48.07
1950 (preliminary)	69,700	271	18,889,000	150,860,000	87	6,790	.58	45.01

[1] Includes antimony, bauxite, chromite, cobalt, manganese, mercury, molybdenum, pyrite, titanium, tungsten, and vanadium-uranium mines.

worked. The average length of shift for all metal-mines was 7.99 or equal to that in 1949. However, because of the increased average number of active working days, the average metal-mine employee accumulated 2,164 hours for the year, or 149 hours more than in 1949.

Iron Mines.—The safety record at iron mines continued to improve, although the number of fatalities was identical with that in 1949. The frequency rate for the 21 fatalities in 1950 was 0.35, or 8 percent lower than in 1949. The total number of nonfatal injuries dropped to 1,095 for a frequency rate of 18.40 per million man-hours of exposure. Employment was stable; and, as the mines were active 18 more days, the total worktime increased 7 percent over 1949. The average iron-mine employee worked an 8.00-hour shift and accumulated 2,141 hours, or 147 hours more than in 1949.

Copper Mines.—Injury experience at copper mines in 1950 showed a rise in the fatality frequency rate but an improved nonfatal rate. An increase of five in the number of fatalities caused an increase in frequency rate to 0.47 per million man-hours of exposure, or 27 percent higher than the 1949 rate. The number of nonfatal injuries increased 25, but the increase in working time had the effect of reducing the frequency rate. Although the average number of employees working daily decreased slightly in 1950, 29 more days were worked, increasing the worktime 9 percent over 1949. The average worker had a 7.96-hour work shift and an aggregate of 2,387 hours, or 220 hours more than in 1949.

Lead-Zinc Mines.—The fatality record at lead-zinc mines in 1950 was poor. The frequency rate was 1.03 per million man-hours of exposure, or 36 percent over the 1949 rate of 0.76. The nonfatal frequency rate improved to 83.58, or 6 percent below that of the preceding year. Employment decreased 10 percent, but the average worktime was not similarly affected because the average number of active mine days increased 8 percent. The average length of shift—8.03 hours—enabled the average worker to accumulate 2,104 hours, an increase of 161 hours over 1949.

Gold-Silver Lode Mines.—The safety record at gold-silver lode mines was worse than in 1949. The fatality frequency rate increased to 0.93 or 10 percent and the nonfatal rate to 120.37 or 8 percent. This latter rate was higher than the rates in the four preceding years. Employment remained stable, and there was only a slight increase—5 days—in the active mine worktime. The average worker had a 7.75-hour shift and accumulated 2,038 hours, or 32 more than in 1949.

Gold Placer Mines.—For the second successive year, there were no fatalities at gold placers. The total of 140 nonfatal injuries in 1950 was 47 less than in 1949, or a reduction of 25 percent, and the frequency rate of 23.97 injuries per million man-hours of exposure was a 22-percent decrease from that in 1949. The mines were slightly less active than in the preceding year, with the average number of men working daily decreasing by 123 and the total mine days by 2. The average employee had a 8.02-hour shift and accumulated 1,718 hours, or 10 hours less than in 1949.

Miscellaneous Metal Mines.—Injury experience at miscellaneous metal mines was worse in 1950 than in 1949. There were 4 more fatal and 50 more nonfatal injuries. The fatality frequency rate of 1.03 was 194 percent greater than in 1949, and the nonfatal frequency rate of 78.31 was 11 percent greater. The average number of men working daily decreased by 80, but 10 days more were worked. An average employee in this group had an 8.08-hour shift and accumulated 2,235 hours, or 94 more than in 1949.

NONMETAL MINES (EXCEPT STONE QUARRIES)

The injury experience in this group, which includes barite, feldspar, fluorspar, gypsum, magnesite, mica, phosphate rock, rock salt, sulfur, and miscellaneous nonmetallic operations, was not favorable in 1950. The fatality frequency rate of 0.70 almost doubled the 1949 rate, and that for nonfatal injuries decreased, although slightly, over the rate of 41.75 in 1949. The average number of active mine-days increased by 14, with a corresponding increase in the total number of man-hours worked. The average employee at mines in this group had an 8.10-hour shift, and accumulated 2,359 hours, or 128 more than in 1949.

TABLE 6.—Employment and injury experience at nonmetal mines (except stone quarries) in the United States, 1946–50 [1]

Year	Men working daily	Average active mine-days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
1946	11,312	291	3,296,626	26,876,871	26	1,369	0.97	50.94
1947	12,176	292	3,554,901	28,809,150	12	1,308	.42	45.40
1948	11,950	287	3,432,304	27,784,119	15	1,176	.54	42.33
1949	12,077	277	3,340,482	26,948,124	10	1,125	.37	41.72
1950 (preliminary)	12,100	291	3,525,000	28,540,000	20	1,160	.70	41.75

[1] Includes barite, feldspar, fluorspar, gypsum, magnesite, mica, phosphate rock, rock salt, sulfur, and miscellaneous nonmetallic-mineral mines.

STONE QUARRIES

Injury experience in the quarrying industries was slightly better in 1950 than in 1949. The 42 fatal injuries during the year occurred at the rate of 0.23 per million man-hours, a 36-percent decrease from 1949. The number of nonfatal injuries declined 166 to 4,660 during 1950. The nonfatal-injury frequency rate of 25.37 was 4 percent lower than in 1949.

The average number of men working daily during 1950 advanced 1 percent to 83,000; they worked an aggregate of 183,660,000 man-hours. The average length of shift rose slightly to 8.10 hours in 1950; however, the average employee in the quarry industry worked 2,213 hours compared with 2,217 hours in 1949 because of a slight reduction in the number of active-plant days.

Cement Quarries.—The cement-industry safety record showed an over-all improvement in the frequency rate for all injuries. There was no increase in the number of fatal injuries in 1950 over 1949, as 18 men were fatally injured in both years. The nonfatal injuries declined 62 in number, and the nonfatal injury rate was approximately 10 percent lower than in 1949. Employment of 28,800 men was slightly lower than the number of men working in 1949; also, 3 fewer

TABLE 7.—Employment and injury experience at stone quarries in the United States, 1946–50, by industry groups

Industry and year	Men working daily	Average active mine-days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Cement: [1]								
1946	25,901	311	8,063,361	64,185,021	12	834	0.19	12.99
1947	28,184	315	8,883,904	70,756,640	26	820	.37	11.59
1948	28,278	328	9,270,125	73,778,909	24	786	.33	10.65
1949	28,824	327	9,411,961	73,540,505	18	597	.24	8.12
1950 (preliminary)	28,800	324	9,339,000	72,750,000	18	535	.25	7.35
Limestone:								
1946	20,850	234	4,870,876	41,864,367	26	1,878	.62	44.86
1947	21,177	246	5,218,930	44,209,247	24	1,921	.54	43.45
1948	22,335	244	5,445,881	45,665,097	26	1,703	.57	37.29
1949	25,710	232	5,954,282	49,828,625	27	1,829	.54	36.71
1950 (preliminary)	25,800	229	5,897,000	50,150,000	15	1,815	.30	36.19
Lime: [1]								
1946	8,741	296	2,591,301	20,657,787	4	1,011	.19	48.94
1947	9,254	291	2,690,488	21,669,032	6	1,022	.28	47.16
1948	9,459	304	2,878,887	22,867,674	9	931	.39	40.71
1949	9,138	297	2,709,511	21,344,370	8	798	.37	37.39
1950 (preliminary)	9,500	298	2,831,000	22,120,000	4	735	.18	33.23
Marble:								
1946	2,370	260	616,200	5,292,992		173		32.68
1947	3,165	262	830,620	6,833,627	2	200	.29	29.27
1948	2,747	266	730,699	5,876,884	1	167	.17	28.42
1949	2,815	255	719,207	5,962,020		227		38.07
1950 (preliminary)	2,700	251	677,000	5,640,000	2	180	.35	31.91
Granite:								
1946	5,176	249	1,288,468	10,930,012	5	493	.46	45.11
1947	5,726	253	1,451,371	12,003,295	4	652	.33	54.32
1948	5,818	256	1,490,656	12,467,119	6	590	.48	47.32
1949	6,972	247	1,719,109	14,216,896	5	574	.35	40.37
1950 (preliminary)	7,300	244	1,784,000	14,800,000		585		39.53
Traprock:								
1946	2,493	244	607,405	5,125,217	3	221	.59	43.12
1947	2,470	242	597,234	5,080,337	3	261	.59	51.37
1948	2,505	238	594,938	5,064,034	4	257	.79	50.75
1949	2,815	230	647,414	5,503,529	3	240	.55	43.61
1950 (preliminary)	2,800	229	640,000	5,470,000	2	280	.37	51.19
Slate:								
1946	1,323	274	361,855	3,330,047	2	181	.60	54.35
1947	1,740	267	465,449	4,174,220	3	243	.72	58.21
1948	1,952	262	512,126	4,511,472	3	188	.66	41.67
1949	1,820	260	472,868	4,061,750	3	217	.74	53.43
1950 (preliminary)	1,900	265	504,000	4,370,000	1	190	.23	43.48
Sandstone:								
1946	3,411	253	862,381	7,142,732	3	346	.42	48.44
1947	3,529	243	858,419	7,252,419	7	385	.97	53.09
1948	4,250	252	1,070,005	8,879,320	2	372	.23	41.90
1949	4,115	227	934,969	7,800,638	2	344	.26	44.10
1950 (preliminary)	4,200	239	1,003,000	8,360,000		340		40.67
Total:								
1946	70,265	274	19,261,847	158,528,175	55	5,137	.35	32.40
1947	75,245	279	20,996,415	171,978,817	75	5,504	.44	32.00
1948	77,344	284	21,993,317	179,110,509	75	4,994	.42	27.88
1949	82,209	275	22,569,321	182,258,333	66	4,826	.36	26.48
1950 (preliminary)	83,000	273	22,675,000	183,660,000	42	4,660	.23	25.37

[1] Includes burning or calcining and other mill operations.

days were worked, and the average length of shift in 1950 was 7.79 hours against 7.81 for 1949.

Limestone Quarries.—The safety record of limestone operations was much improved in 1950 over 1949. The fatality rate per million man-hours of employment was much lower, as was the actual number of fatalities. A slight improvement in the nonfatal injury rate in 1950 over 1949 was due to a decrease of less than 1 percent in the actual number of nonfatal injuries and a small increase in the number of man-hours worked. The number of men working rose slightly, but each employee had an average of 3 fewer working days in 1950 than in 1949. The average employee worked 1,944 hours during 1950, only 6 more than in 1949. The length of shift worked in 1950 was 8.50 hours compared to 8.37 in the previous year.

Lime Plants.—The number of fatal injuries was reduced, and the fatality rate at lime plants in 1950 decreased 51 percent compared with 1949. The nonfatal rate also improved 11 percent over the previous year. Employment in the lime operations increased, as did the man-hours worked; the average length of shift for the year was 7.81 hours.

Marble Quarries.—Although the average number of men employed and the number of man-hours worked in the marble quarries during 1950 decreased from 1949, the fatal injury record showed a frequency rate of 0.35 per million man-hours worked against a fatality-free year in 1949. However, the nonfatal injury record improved 16 percent over the year 1949. The average employee had an 8.33-hour shift and worked 2,089 hours during the year.

Granite Quarries.—No fatal injuries were reported at granite quarries in 1950. The number of nonfatal injuries, however, did not improve. Instead, it increased approximately 2 percent over 1949. The average number of men working increased 5 percent and the man-hours 4 percent. The average length of shift worked in 1950 was 8.30 hours; and the average employee worked 2,027 hours, a slight decrease from 1949 due to an average of 3 fewer working days.

Traprock Quarries.—The frequency record for fatal injuries improved 33 percent over 1949. The frequency of nonfatal injuries, however, increased to 51.19 in 1950 from a rate of 43.61 in 1949. The number of men working daily was virtually unchanged from 1949, and the number of working days declined by 1 day. The man-hours worked decreased less than 1 percent.

Slate Quarries.—Although employment in slate operations increased in 1950, the injury-frequency rates improved. The fatal rate improved by 69 percent, and the nonfatal rate improved by 19 percent. The man-hours worked increased by 8 percent over 1949, and the average length of shift was 8.67 hours. The average worktime per man per year was 2,300 hours, or 68 hours more than in 1949.

Sandstone Quarries.—The safety record at sandstone operations improved over 1949. No fatal injuries were reported, and the number of nonfatal injuries declined slightly; the frequency rate was 40.67 per million man-hours worked in 1950. The average length of shift was 8.33 hours, and the average hours worked per man was 1,990 in 1950—94 more than in 1949.

COKE PLANTS

Byproduct-Coke Plants.—The nonfatal rate of 8.52 improved 14 percent over 1949. The fatal rate of 0.21 per million man-hours worked, however, was not so favorable, due to an increase of six fatal injuries over 1949. The average number of men working declined, but the number of man-hours worked increased 3 percent, as did the number of days active for the year. The average work-shift in 1950 was 8.02 hours compared with 7.98 in 1949.

Beehive-Coke Plants.—There was one fatal injury in the beehive-coke plants in 1950 and a 100-percent increase in the number of

TABLE 8.—Employment and injury experience at coke plants in the United States, 1946–50

Type and year	Men working daily	Average active plant-days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Non-fatal	Fatal	Non-fatal
Byproduct ovens:								
1946	18,906	354	6,693,947	53,547,047	8	648	0.15	12.10
1947	20,778	362	7,526,622	60,271,826	11	701	.18	11.63
1948	21,877	364	7,964,283	63,788,327	17	676	.27	10.60
1949	21,141	349	7,373,684	58,822,239	7	581	.12	9.88
1950	20,942	362	7,577,665	60,593,087	13	516	.21	8.52
Beehive ovens:								
1946	2,504	204	510,740	4,163,075		162		38.91
1947	2,927	262	766,542	5,846,933	4	225	.68	38.48
1948	3,280	254	833,606	6,233,002	3	241	.48	38.67
1949	3,330	146	486,497	3,623,543		132		36.43
1950	3,405	210	714,470	5,267,918	1	264	.19	50.11
Total:								
1946	21,410	337	7,204,687	57,710,122	8	810	.14	14.04
1947	23,705	350	8,293,164	66,118,759	15	926	.23	14.01
1948	25,157	350	8,797,889	70,021,329	20	917	.29	13.10
1949	24,471	321	7,860,181	62,445,782	7	713	.11	11.42
1950	24,347	341	8,292,135	65,861,005	14	780	.21	11.84

nonfatal injuries. This increase over 1949 was due to a greater number of active plant days and a 45-percent increase in the number of man-hours worked. The average employee worked a 7.37-hour shift and a total of 1,547 hours—an increase of 459 hours over 1949.

METALLURGICAL PLANTS

The over-all safety record at metallurgical plants did not change materially in 1950. The fatality frequency rate at metal mills was 0.20 per million man-hours of exposure, equal to the 1949 rate, and the nonfatal frequency rate declined to 22.61 from 22.82 in 1949. At nonferrous smelters 4 more fatalities and 51 more nonfatal injuries were charged against the industry than in the preceding year. Employment at metal mills decreased 6 percent, but the average active mill days increased 9 percent. At smelters, respective percentages were 2 and 6. The aggregate man-hours of work in 1950 at metallurgical plants increased 4 percent.

Ore-Dressing Plants.—Injury experience at metal mills in 1950 improved slightly over 1949. The injury frequency rate (fatal and nonfatal) was 22.81, and for the preceding year it was 23.02. The fatality rate decreased at copper and iron mills, and for the second successive year there were no fatalities at lead-zinc and miscellaneous metal mills. The best nonfatal frequency rates were attained at iron and miscellaneous metal mills.

This group includes crushing, screening, washing, jigging, magnetic separation, flotation, and other milling operations on metallic ores. Except at iron and miscellaneous metal mills, the average number of men working daily decreased over-all by 6 percent. The plants were active 24 days more than in 1949, with the result that the man-hours worked in this group rose slightly over 1949. In all groups, except gold-silver and lead-zinc, man-days worked were higher in 1950. The gain in employment at miscellaneous metal mills, so distinctly

TABLE 9.—Employment and injury experience at ore-dressing plants in the United States, 1946–50, by industry groups [1]

Industry and year	Men working daily	Average active mill days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Non-fatal	Fatal	Non-fatal
Copper:								
1946	5,579	279	1,555,028	12,435,937	1	322	0.08	25.89
1947	5,846	323	1,887,600	15,100,609	2	288	.13	19.07
1948	6,308	317	1,998,932	15,998,431	4	289	.25	18.06
1949	6,582	294	1,937,717	15,526,435	3	233	.19	15.01
1950 (preliminary)	5,900	336	1,980,000	15,840,000	2	240	.13	15.15
Iron:								
1946	3,286	190	623,715	5,096,279	1	67	.20	13.15
1947	3,343	245	820,014	6,662,689	2	86	.30	12.91
1948	3,259	267	870,632	7,040,488	-------	101	-------	14.35
1949	3,701	215	794,121	6,446,190	3	96	.47	14.89
1950 (preliminary)	3,700	239	886,000	7,140,000	3	90	.42	12.61
Gold-silver:								
1946	1,015	263	267,053	2,077,925	1	89	.48	42.83
1947	1,107	282	312,564	2,450,112	1	138	.41	56.32
1948	919	287	263,644	2,064,381	1	106	.48	51.35
1949	935	288	269,389	2,106,362	-------	83	-------	39.40
1950 (preliminary)	900	281	253,000	1,980,000	-------	90	-------	45.45
Lead-zinc:								
1946	4,388	276	1,212,603	9,720,505	6	303	.62	31.17
1947	4,384	264	1,158,113	9,291,639	2	270	.22	29.06
1948	3,998	263	1,050,895	8,430,578	3	237	.36	28.11
1949	4,018	241	968,005	7,747,429	1	220	.13	28.40
1950 (preliminary)	3,600	255	918,000	7,340,000	2	230	.27	31.34
Miscellaneous metals: [2]								
1946	1,329	259	344,264	2,750,897	1	85	.36	30.90
1947	1,257	269	338,547	2,707,720	-------	89	-------	32.87
1948	1,150	280	321,751	2,570,479	1	101	.39	39.29
1949	1,452	270	391,600	3,147,204	-------	166	-------	52.75
1950 (preliminary)	1,600	274	438,000	3,530,000	-------	160	-------	45.33
Total:								
1946	15,597	257	4,002,663	32,081,543	10	866	.31	26.99
1947	15,937	283	4,516,838	36,212,769	7	871	.19	24.05
1948	15,634	288	4,505,854	36,104,357	9	834	.25	23.10
1949	16,688	261	4,360,832	34,973,620	7	798	.20	22.82
1950 (preliminary)	15,700	285	4,475,000	35,830,000	7	810	.20	22.61

[1] Includes crushers, grinders, washers, ore concentration, sintering, cyaniding, leaching, and all other metallic ore-dressing plants and auxiliary works.
[2] Includes antimony, bauxite, mercury, manganese, tungsten, chromite, vanadium, molybdenum, and other metals.

marked in 1949 over 1948, continued in 1950, resulting in a 12-percent increase in man-hours worked. The average employee shift in 1950 in ore-dressing plants was 8.01 hours.

Nonferrous Reduction Plants and Refineries.—Iron and steel plants are not included in this group, but it does include reduction plants and refineries that are engaged in primary extraction of nonferrous metals from ores and concentrates and refining of crude primary nonferrous metals.

The over-all injury experience at nonferrous smelters and refineries was more favorable in 1950 than in 1949. The injury frequency rate (fatal and nonfatal) decreased from 23.15 to 22.93. Although fatalities increased by 4 in 1950 and nonfatal injuries by 51, the combined rate was reduced by a 4-percent increase in man-hours worked because of an increase of 18 active smelter days. The fatality frequency rate increased in each group except copper, where fatalities were cut almost in half. The nonfatal frequency rate decreased at copper and zinc smelters. Employment declined slightly at each group of smelters except at the miscellaneous metal smelter. Plants in each group were active more days than in 1949, and the total man-hours worked in each group increased materially, except at lead smelters. The average employee working shift was 8.02 hours.

TABLE 10.—Employment and injury experience at primary nonferrous reduction and refinery plants in the United States, 1946–50, by industry groups [1]

Industry and year	Men working daily	Average active smelter days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
Copper:								
1946	10,187	289	2,946,354	23,572,764	6	503	0.25	21.34
1947	12,393	322	3,992,485	31,938,431	7	726	.22	22.73
1948	12,419	326	4,053,333	32,495,627	2	592	.06	18.22
1949	11,626	305	3,549,484	28,395,270	8	511	.28	18.00
1950 (preliminary)	11,500	325	3,737,000	29,900,000	5	520	.17	17.39
Lead:								
1946	3,848	255	980,243	7,844,293	-------	160	-------	20.40
1947	3,679	331	1,219,309	9,750,024	4	197	.41	20.21
1948	4,037	323	1,302,463	10,419,706	1	188	.10	18.04
1949	4,045	306	1,239,792	9,918,334	2	164	.20	16.54
1950 (preliminary)	3,700	307	1,137,000	9,050,000	4	165	.44	18.23
Zinc:								
1946	9,917	338	3,356,262	26,199,631	4	915	.15	34.92
1947	10,484	345	3,616,035	28,667,924	1	994	.03	34.67
1948	9,843	342	3,367,815	26,875,360	1	843	.04	31.37
1949	9,573	318	3,044,234	24,118,138	5	791	.21	32.80
1950 (preliminary)	9,100	350	3,187,000	25,310,000	9	780	.36	30.82
Miscellaneous metals: [2]								
1946	5,405	277	1,496,988	11,974,531	-------	350	-------	29.23
1947	6,589	305	2,007,873	16,061,153	2	440	.12	27.40
1948	5,835	324	1,891,583	15,132,655	1	292	.07	19.30
1949	5,731	320	1,836,176	14,689,399	1	303	.07	20.63
1950 (preliminary)	6,000	324	1,944,000	15,980,000	2	355	.13	22.22
Total:								
1946	29,357	299	8,779,847	69,591,219	10	1,928	.14	27.70
1947	33,145	327	10,835,702	86,417,532	14	2,357	.16	27.27
1948	32,134	330	10,615,194	84,923,348	5	1,915	.06	22.55
1949	30,975	312	9,669,686	77,121,141	16	1,769	.21	22.94
1950 (preliminary)	30,300	330	10,005,000	80,240,000	20	1,820	.25	22.68

[1] Includes smelters, refineries, roasting, electrolytic, retort, and all other nonferrous metal reducing or refining plants.
[2] Includes mercury, antimony, tin, and magnesium plants.

232294—53——7

PART II. COMMODITY REVIEWS

Abrasive Materials

By Henry P. Chandler and G. E. Tucker

GENERAL SUMMARY

THE year 1950 was one of increased activity in almost all branches of the abrasives industry, with nearly all abrasive materials showing a marked increase in tonnage and value. New records were made in the production of tripoli, ground sand and sandstone, pumice and pumicite, and garnet. Total production of crude artificial abrasives in the United States and Canada increased 17 percent in tonnage and 30 percent in value.

Imports of industrial diamonds increased 100 percent in total value and 72 percent by weight, the 1950 importation being the largest since 1944. Imports of corundum increased 76 percent in tonnage and 4 percent in value.

TABLE 1.—Salient statistics of the abrasives industries in the United States, 1949–50

	1949		1950		Percent of change	
	Short tons	Value	Short tons	Value	Short tons	Value
Natural abrasives (domestic) sold or used by producers:						
Diatomite	(1)	(1)	(1)	(1)		
Tripoli	25,525	$690,564	43,720	$1,173,647	+71	+70
Quartz	107,552	475,491	160,508	706,724	+49	+49
Ground sand and sandstone	610,789	5,258,464	750,673	6,462,503	+23	+23
Grindstones	4,479	244,704	4,435	230,462	−1	−6
Pulpstones	28	1,975	33	2,100	+18	+6
Millstones	(2)	9,400	(2)	11,300		+20
Tube-mill liners	1,166	47,093	1,523	62,535	+31	+33
Grinding pebbles	2,374	64,038	1,923	53,007	−19	−17
Pumice and pumicite	716,742	2,369,082	719,356	2,661,052	(3)	+12
Garnet	6,578	505,231	9,304	793,558	+41	+57
Emery	4,909	60,917	5,949	75,308	+21	+24
Artificial abrasives:						
Silicon carbide—production [4]	67,539	6,055,763	65,004	7,303,671	−4	+21
Aluminum oxide—production [4]	125,806	8,500,074	140,352	11,958,035	+12	+41
Metallic abrasives (steel shot and grit)—shipments	104,778	9,312,368	144,333	11,699,764	+38	+26
Foreign trade (natural and artificial abrasives):						
Imports		[5] 26,389,394		47,071,270		+78
Exports		17,447,399		16,188,782		−7

[1] Average annual figure for 1948–50 was 240,890 short tons valued at $6,153,780; annual data not published separately in this case to avoid disclosing individual company operations.
[2] Tonnage not recorded.
[3] Less than 0.5 percent.
[4] Includes Canadian production.
[5] Revised figure.

This chapter includes data for most materials used for abrasive purposes, but certain clays, carbides, oxides, and other substances noted later under Miscellaneous Mineral-Abrasive Materials are not included in the statistics shown herein. Certain abrasive products for which figures are given also have important nonabrasive uses.

NATURAL SILICA ABRASIVES

Diatomite.—The production of diatomite continued to increase during 1950. To avoid disclosing individual company operations, the Bureau of Mines, in this case, does not publish the annual data separately; however, the average production for the 3 years 1948–50 was 240,890 short tons valued at $6,153,780, compared with 213,590 short tons valued at $4,307,100 for 1945–47, an increase of 13 percent by weight and 43 percent in value.

During 1950 diatomite was produced for sale in four States—California, Nevada, Oregon, and Washington. Increases in production were reported from three of these States. A small amount of crude material was mined in Utah.

The principal uses for which diatomite was consumed during 1950 were: Filtration, 57 percent; fillers, 28 percent; insulation, 8 percent; and other uses, including abrasives, 7 percent.

The plant of the Johns-Manville Co. near Lompoc, Calif., was enlarged in 1950.

As quoted in E&MJ Metal and Mineral Markets, prices of diatomite during 1950 continued unchanged from the previous year as follows (per ton, crude, in bulk, dried, nominal): Nevada, f. o. b. mill, 98- to 100-mesh, $25; low-temperature insulation, $25; high-temperature insulation, $40; fine abrasive, 2 to 3 cents a pound (bags extra); California, filtration grades, $20 to $50 f. o. b. mill.

Diatomaceous earth as a substitute for cinders in the manufacture of lightweight concrete and building blocks received special attention.[1] The use of diatomaceous earth as a catalyst in low-temperature hydrogen production was described.[2] Diatomaceous earth for filtering swimming-pool water is gaining in favor.[3] An article on the production of diatomite in Kenya, British East Africa, describing the character of the ore, mining conditions, and method of treatment, was published.[4]

Tripoli.—The sales of tripoli, amorphous silica, and rottenstone totaled 43,720 tons valued at $1,173,647 in 1950, an increase of 71 percent in tonnage and 70 percent in value over 1949. It was produced in Illinois, Missouri, and Pennsylvania.

The use of tripoli as an abrasive increased some 66 percent in 1950 over 1949. The other uses—for fillers, foundry facing, etc.—also increased materially.

---

[1] Conley, John E., and Ruppert, John A., Recent Developments in the Manufacture of Lightweight Aggregates: Mining Eng., vol. 187, No. 4, April 1950, p. 479.

[2] Ipatieff, V. N., Monroe, G. S., Fischer, L. E., Low-Temperature Hydrogen Production: Ind. Eng. Chem., vol. 42, No. 1, January 1950, p. 92.

[3] Miller, Shelby A., Filtration: Ind. Eng. Chem., vol. 42, No. 1, January 1950, p. 53.

[4] Barnard, G. Canning, Diatomite and Its Production in Kenya Colony: Mining Mag., London, vol. 82, No. 5, May 1950, pp. 271–274.

Companies producing tripoli, amorphous silica, and rottenstone in 1950 were: Ozark Minerals Co., Cairo, Ill. (amorphous silica); Tamms Industries, Inc., 228 North LaSalle St., Chicago 1, Ill. (amorphous silica); American Tripoli Corp., Seneca, Mo., mine in Oklahoma, mill in Missouri (tripoli); Penn Paint & Filler Co., Antes Fort, Pa. (rottenstone); and Keystone Filler & Mfg. Co., Muncy, Pa. (rottenstone).

TABLE 2.—Tripoli [1] sold or used by producers in the United States, 1944–47, and 1948–50, by uses

Year and use	Short tons	Value	Year and use	Short tons	Value
1944	18,425	$301,863	1949: Abrasives	20,972	$587,241
1945	18,247	306,829	Filler	2,820	53,938
1946	28,955	549,099	Foundry facing, etc.	1,733	49,385
1947	34,578	751,422	Total	25,525	690,564
1948: Abrasives	22,193	606,402	1950: Abrasives	34,865	968,497
Filler	2,723	45,000	Filler	6,744	147,379
Foundry facing, etc.	1,929	54,121	Foundry facing, etc.	2,111	57,771
Total	26,845	705,523	Total	43,720	1,173,647

[1] Including amorphous silica and Pennsylvania rottenstone.

The use of tripoli as a mild abrasive and in automobile polishes was described.[5] The appearance of a German tripoli on the United States market was reported.[6]

Quotations on tripoli in E&MJ Metal and Mineral Markets during 1950 increased over the previous year. At the end of the year the following prices were quoted (per short ton, paper bags, minimum carlot 30 tons, f. o. b. Missouri): Once-ground through 40-mesh, rose and cream, $30; double-ground through 110-mesh, rose and cream, $32; air-floated through 200-mesh, $35.

Quotations appearing in Oil, Paint and Drug Reporter: Air-floated in bags, $35 a ton; double-graded, $32 a ton; single-graded, $30; all prices f. o. b. works.

Quartz.—Total sales of crude, crushed, and ground quartz from pegmatite veins or dikes and from quartzite in 1950 increased 49 percent both in tonnage and value compared with 1949. However, neither the tonnage nor value was quite as high as 1948. The principal uses for which the reported tonnage was consumed included glass and ferrosilicon, with smaller quantities for abrasives, filters, pottery, tile, and miscellaneous. The sales of crude quartz were less than in the previous year, but sales of crushed and ground quartz were the largest on record. These do not include sales of quartzite to cement mills and certain sales of quartz or quartzite for use in the manufacture of ferrosilicon.

The average value of the quartz reported in this section was $4.40 per ton in 1950 compared with $4.42 in 1949 and $4.64 in 1948.

[5] Moore, A. E., Automobile Polishes, Cleaners, and Waxes: Chem. Ind., vol. 66, No. 3, March 1950, p. 385.

[6] Meyerhoff, Howard A., Industrial Minerals in 1949: Mining Eng., vol. 187, No. 1, January 1950, p. 69.

TABLE 3.—Quartz (crude, crushed, and ground) sold or used by producers in the United States, 1946–50 [1]

Year	Crude		Crushed		Ground [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	38,587	$107,069	29,228	$109,437	5,364	$77,346	73,179	$293,852
1947	21,940	118,231	62,169	170,254	17,208	136,040	101,317	424,525
1948	41,081	250,184	104,496	374,781	16,284	125,702	161,861	750,667
1949	15,816	74,562	72,432	257,213	19,304	143,716	107,552	475,491
1950	11,062	52,591	117,499	430,256	31,947	223,877	160,508	706,724

[1] Does not include sales of quartzite to cement mills or certain sales of quartz or quartzite for use in the manufacture of ferrosilicon.
[2] To avoid duplication, the ground material shown here is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.

TABLE 4.—Quartz (crude, crushed, and ground)[1] sold or used by producers [2] in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Arizona, California, Oregon, Washington	91,926	$493,481	51,185	$212,114	[3] 89,290	[3] $318,720
Connecticut			16,225	97,350	27,560	166,810
Massachusetts	792	7,288	577	4,265	2,145	23,646
Other States [4]	69,143	249,898	39,565	161,762	41,513	197,548
Total	161,861	750,667	107,552	475,491	160,508	706,724

[1] To avoid duplication, the ground material included is only that ground by the original producers of the crude quartz or by grinders who purchase from small miners not reporting their production.
[2] Does not include sales of quartzite to cement mills or certain sales of quartz or quartzite for use in the manufacture of ferrosilicon.
[3] Arizona included with "Other States" to avoid disclosure of individual company operations.
[4] Arizona (1950), Maine (1950), Maryland (1948–49), North Carolina, South Dakota (1948), Tennessee (1948), and Wisconsin (1948–49).

Occurrences of quartz in Georgia have been described.[7] Recent discoveries of quartz deposits in the State of Goias, Brazil, have attracted much interest.[8] New quartz deposits containing some large crystals are reported in Burma.[9]

Ground Sand and Sandstone.—The sales of ground sand and sandstone in 1950 increased 23 percent both in tonnage and in value over 1949, making 1950 a record year for these commodities. The average value per ton in 1950 was $8.61 compared with $8.61 and $8.34 in 1949 and 1948, respectively. Illinois, the largest producing State, accounted for 35 percent of the total, with sales that increased 21 percent over 1949. Production from Idaho was noted for the first time. All other States for which data are shown also increased in production, the large producers being New Jersey, West Virginia, Ohio, and Pennsylvania, as in 1949.

[7] Georgia Mineral Society News Letter, vol. 3, No. 3, May–June 1950, p. 72.
[8] Mining World, vol. 12, No. 11, October 1950, p. 53.
[9] Mineralogist, Some Giant Quartz Crystals and Spheres: Vol. 18, No. 7–8, July–August 1950, pp. 384–386.

TABLE 5.—Ground sand and sandstone sold or used by producers in the United States, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	533,656	$3,709,597	1948	692,773	$5,778,277
1946	575,888	4,125,398	1949	610,789	5,258,464
1947	644,508	5,154,264	1950	750,673	6,462,503

TABLE 6.—Ground sand and sandstone sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Georgia	1,909	$17,183	771	$7,712	1,176	$11,760
Idaho					3,700	29,600
Illinois	232,971	1,943,284	217,577	1,887,144	263,122	2,278,237
Massachusetts	2,150	14,000	1,514	9,650	1,829	9,882
New Jersey	116,832	782,644	107,946	755,215	131,744	936,817
Ohio, Virginia, and West Virginia	193,289	1,781,053	192,134	1,776,717	218,281	2,002,703
Washington	6,682	33,783	(1)	(1)	(1)	(1)
Other States [2]	138,940	1,206,330	90,847	822,026	130,821	1,193,504
Total	692,773	5,778,277	610,789	5,258,464	750,673	6,462,503

[1] Included with "Other States" to avoid disclosure of individual company operations.
[2] California, Missouri, North Carolina (1950), Oklahoma (1949–50), Pennsylvania, Texas (1948), Washington (1949–50), and Wisconsin.

Consumers of ground sand and sandstone in 1950 were the pottery, porcelain, and tile industries (38 percent of the tonnage for which uses were reported), abrasives industries—chiefly cleansing and scouring compounds (21 percent), foundries (13 percent), fillers (11 percent), enamel (4 percent), and other (13 percent); glass sand decreased. The distribution by uses in 1950 was based on reports from companies accounting for 93 percent of the total sales.

TABLE 7.—Ground sand and sandstone sold or used by producers in the United States in 1950, by uses [1]

Use	Short tons	Value	
		Total	Average per ton
Abrasive:			
Cleansing and scouring compound	139,502	$1,170,667	$8.39
Other	4,704	39,368	8.37
Enamel	30,885	244,921	7.93
Filler	76,224	609,036	7.99
Filter	1,400	14,000	10.00
Foundry	89,779	700,880	7.81
Glass	5,330	41,070	7.71
Pottery, porcelain, and tile	267,394	2,520,889	9.43
Other uses	84,177	659,602	7.84
Total reported by uses	699,395	6,000,433	8.58

[1] Data represent 93 percent of total sales.

Abrasive Sands.—Considerable tonnages of natural sands with a high silica content are sold for abrasive purposes, such as glass grinding, stone polishing, coating sandpaper, and sand blasting. Sales of these sands in 1950 totaled 1,299,760 short tons valued at $2,670,791 compared with 1,080,886 valued at $2,063,866 in 1949. The 1950 figures include 470,717 tons of blast sand valued at $1,463,623, an increase of 20 percent in quantity and 20 percent in value compared with 1949. Detailed data regarding tonnages produced in each State appear in the Sand and Gravel chapter of this volume.

SPECIAL SILICA-STONE PRODUCTS

Grindstones and Pulpstones.—The sales of grindstones declined slightly in 1950, but those of pulpstones increased. The tonnage of grindstones sold was the lowest on record. Ohio and West Virginia were the only States reporting the manufacture of grindstones, and pulpstones were produced only in Washington.

TABLE 8.—Grindstones and pulpstones sold by producers in the United States, 1946–50

Year	Grindstones		Pulpstones		
	Short tons	Value	Quantity: Pieces	Quantity: Equivalent short tons	Value
1946	11, 605	$501, 444	22	72	$3, 880
1947	10, 620	476, 811	24	76	4, 976
1948	7, 921	402, 667	12	33	2, 100
1949	4, 479	244, 704	7	28	1, 975
1950	4, 435	230, 462	12	33	2, 100

Oilstones and Other Sharpening Stones.—Output of natural sharpening stones increased sharply in 1950 and doubled the 1949 production. The Bureau of Mines is not at liberty to publish the exact figures because of the small number of producers. Producing States in 1950 were: Arkansas—oilstones and whetstones; Indiana—whetstones and rubbing stones; New Hampshire—scythestones; and Ohio—scythestones, whetstones, and rubbing stones (holystones).

Millstones.—The value of millstones increased slightly over 1949. No chasers were reported in 1950. States marketing millstones in 1950 were North Carolina (Rowan County) and Virginia (Montgomery County).

TABLE 9.—Value of millstones and chasers sold by producers in the United States, 1945–50 [1]

Year	Number of producers	Value	Year	Number of producers	Value
1945	4	$15, 018	1948	3	$17, 733
1946	4	14, 780	1949	2	9, 400
1947	4	23, 189	1950	2	11, 300

[1] Produced in Minnesota (1945 only), New York (1945–48), North Carolina, and Virginia.

Grinding Pebbles and Tube-Mill Liners.—The output of grinding pebbles in 1950 decreased both in quantity and value from 1949, but the sale of tube-mill liners increased. The combined output showed very little change from 1949. The States from which grinding pebbles were reported in 1950 were: Minnesota, North Carolina, Texas, Washington, and Wisconsin. Tube-mill liners were produced in Minnesota, North Carolina, and Wisconsin as in 1949.

TABLE 10.—Grinding pebbles and tube-mill liners sold or used by producers in the United States, 1946–50

Year	Grinding pebbles		Tube-mill liners		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	4,652	$102,043	2,375	$44,247	7,027	$146,290
1947	5,860	122,883	1,496	40,303	7,356	163,186
1948	4,026	101,583	1,297	41,555	5,323	143,138
1949	2,374	64,038	1,166	47,093	3,540	111,131
1950	1,923	53,007	1,523	62,535	3,446	115,542

NATURAL SILICATE ABRASIVES

Pumice and Pumicite.—The output of pumice and pumicite (volcanic ash) in 1950 showed a slight increase in tonnage and a 12-percent increase in value over 1949. Its use as an aggregate in lightweight concrete continues to be its largest market.

TABLE 11.—Pumice and pumicite sold or used by producers in the United States,[1] 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	157,011	$1,051,037	1948	607,746	$2,501,906
1946	319,883	1,585,753	1949	716,742	2,369,082
1947	442,552	2,021,880	1950	719,356	2,661,052

[1] Including Alaska.

TABLE 12.—Pumice and pumicite sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
California	196,934	$1,110,447	149,878	$799,602	157,497	$970,826
Idaho	79,426	93,602	71,373	105,360	93,990	121,044
Nebraska	4,000	34,200	4,622	40,000	(1)	(1)
New Mexico	177,630	812,545	351,368	1,026,479	351,642	1,109,883
Oregon	106,277	307,274	104,475	273,427	79,653	320,530
Utah	7,618	30,472	(1)	(1)	8,719	10,891
Washington	26,675	47,787	8,610	18,221	11,013	22,672
Wyoming					1,460	6,353
Other States [2]	9,186	65,579	26,416	105,993	15,382	98,853
Total	607,746	2,501,906	716,742	2,369,082	719,356	2,661,052

[1] Included with "Other States" to avoid disclosure of individual company operations.
[2] Alaska (1948), Arizona (1949), Colorado (1950), Kansas, Montana (1948 and 1950), Nebraska (1950), Nevada (1949–50), Oklahoma, Texas, and Utah (1949).

Output of pumice or pumicite in 1950 was reported from 14 States. The largest producing State was New Mexico, with California second. The largest increase was reported from Idaho. Decreases were noted in Oregon and Nebraska. The combined total from New Mexico, California, Idaho, and Oregon represented 95 percent of the total production compared with 94 percent in 1949.

Average values per ton are as follows: 1950, $3.70; 1949, $3.31; and 1948, $4.12.

TABLE 13.—Pumice and pumicite sold or used by producers in the United States, 1948–50, by uses

Use	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Abrasive:						
Cleansing and scouring compounds and hand soaps	16,005	$245,994	15,926	$188,823	15,362	$198,053
Other abrasive uses	4,508	251,828	8,077	320,017	12,214	410,243
Acoustic plaster	3,612	109,498	10,018	182,990	6,662	151,766
Concrete admixture and concrete aggregate	559,697	1,665,727	672,592	1,559,587	672,125	1,750,269
Other uses [1]	23,924	228,859	10,129	117,665	12,993	150,721
Total	607,746	2,501,906	716,742	2,369,082	719,356	2,661,052

[1] Insecticide, insulation, brick manufacture, filtration, solvents, plastics, paint filler, absorbents, and unspecified.

The tonnage of pumice and pumicite used for concrete admixture and concrete aggregate declined slightly in 1950, but the dollar value increased 12 percent. The amount used for acoustic plaster declined in 1950, but the tonnage and value for all abrasive purposes increased. The tonnage for "other uses" increased 28 percent in 1950; "other uses" included insecticide, insulation, brick manufacture, filtration, solvents, plastics, paint fillers, absorbents, and unspecified. (*See* fig. 1.)

As reported in Oil, Paint and Drug Reporter, quotations on domestic and imported pumice in 1950 remained at nearly the same levels as in 1949 and were as follows: Domestic coarse-ground (sizes 0, ½, 1, 1½, 2, and 3) in bags, ton lots, New York, 3⅝ to 4 cents a pound, smaller lots, 3⅞ to 4½ cents; imported—Italian, silk-screened, fine, in bags, ton lots, 4 cents a pound; coarse, 5½ cents; sun-dried, fine or coarse in bags, ton lots, 2½ cents. The E&MJ Metal and Mineral Markets quoted per pound, f. o. b. New York or Chicago, in barrels, powdered, 3 to 5 cents; lump, 6 to 8 cents.

The use of pumice and pumicite in industrial and concrete products in California was described in the trade press.[10] New pumice block plants are reported in New Mexico and Colorado.[11] Washington State Institute of Technology is currently engaged in a research program on pumice concrete, concentrating on the causes and control of shrinkage in walls constructed with pumice concrete blocks.[12] The Oregon State Department of Geology and Mineral Industries has

[10] Lenhart, Walter B., Color Glamorizes Concrete Units: Rock Products, vol. 53, No. 12, December 1950, pp. 181–183, 190–191.
[11] Rock Products, Pumice Block Plant: Vol. 53, No. 11, November 1950, p. 121.
[12] Rock Products, Pumice Research: Vol. 53, No. 10, October 1950, p. 172.

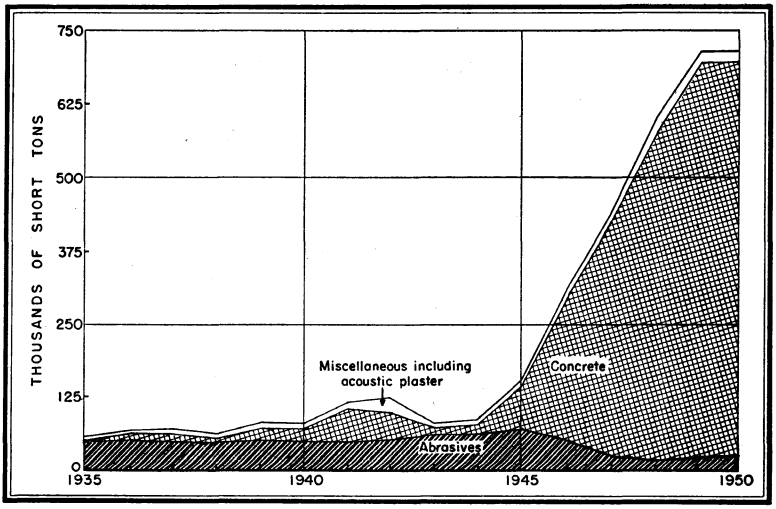

FIGURE 1.—Trends, by uses, of pumice and pumicite sold or used in the United States, 1935–50.

new uses for finely ground pumice, volcanic ash, and perlite.[13] New types of construction embodying the use of units manufactured with pumice are available.[14] Improved methods of processing pumice have been described.[15] The use of wall sections made with pumice has been mentioned.[16] An important deposit of pumice in California was noted.[17] Several problems in connection with the use of pumice and lightweight aggregate were discussed.[18] The pumice deposits of Arizona and their utilization were reviewed recently.[19] Research work in the use of pumice masonry is under way at the Washington State College.[20] New Mexico pumice was to be used in building an 800-home housing project at Biggs Air Force Base, El Paso, Tex.[21]

Garnet.—Garnet production in 1950 was 9,304 short tons valued at $793,558, the largest on record. The trend in output (sales) of garnet since 1920 is shown in figure 2. Producers reporting sales in 1950 were: Idaho Garnet Abrasive Co., Fernwood, Idaho; Willsboro Mining Co., Inc., Willsboro, N. Y.; and the Barton Mines Corp., North Creek, N. Y. The plant at Barton Mines has been enlarged recently, and the sale of fine sizes of garnet to the optical industry has increased. The production and marketing of garnet abrasives from Emerald Creek, Benewah County, Idaho, were the subject of a recent article.[22]

---

[13] Pit and Quarry, vol. 43, No. 5, November 1950, p. 64.
[14] Nordberg, Bror, Prestressed Floor and Roof Slabs of Concrete Masonry Units: Rock Products, vol. 53, No. 1, January 1950, pp. 197–201.
[15] Lenhart, Walter B., Improved Crushing and Grading of Pumice: Rock Products, vol. 53, No. 9, September 1950, pp. 82–85.
[16] Pit and Quarry, vol. 43, No. 4, October 1950, p. 138.
[17] Pit and Quarry, vol. 42, No. 7, January 1950, p. 97.
[18] Pit and Quarry, vol. 42, No. 9, March 1950, p. 174.
[19] Rock Products, Concrete Masonry Booms in Phoenix: Vol. 53, No. 1, January 1950, pp. 204–207, 224–225.
[20] Rock Products, vol. 53, No. 5, May 1950, p. 145.
[21] Engineering and Mining Journal, vol. 151, No. 6, June 1950, p. 123.
[22] Crandall, J. S., Trans. Am. Inst. Min. and Met. Eng., Vol. 187, May 1950, pp. 575–576.

TABLE 14.—Abrasive garnet sold or used by producers in the United States, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	6,306	$375,198	1948	8,039	$587,797
1946	7,743	570,186	1949	6,578	505,231
1947	8,722	614,071	1950	9,304	793,558

As quoted in the E&MJ Metal and Mineral Markets during 1950, the price of New York Adirondack garnet concentrates in grain form was $93 a ton, an advance of $8 a ton over preceding years.

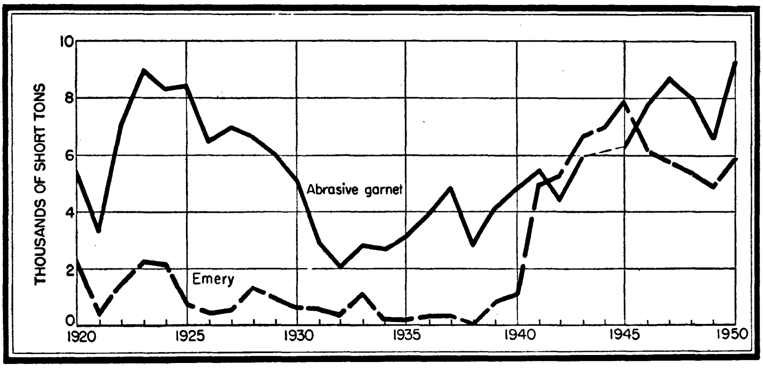

FIGURE 2.—Marketed production of abrasive garnet and domestic emery in the United States, 1920–50.

NATURAL ALUMINA ABRASIVES

Corundum.—The Union of South Africa continued to be the world's largest producer of corundum. The output in that country was 3,201 metric tons in 1950, its largest since 1945.

The United States has produced no corundum in recent years. Imports into the United States in 1950 were 3,543 short tons compared with 2,013 and 3,612 tons in 1949 and 1948, respectively. The American Abrasive Co. continued to be the only importer.

Articles were published in 1950 on the use of corundum by the abrasive industry in India,[23] the occurrence of a corundum deposit of possible commercial importance in Nyasaland,[24] and the corundum situation in South Africa.[25] Other articles described the corundum deposits in Montana [26] and Georgia.[27] The Bureau of Standards has recently developed a practical means of determining the abrasive value of corundum samples.[28]

[23] Sahni, M. R., Abrasives and Grinding Materials: Records Geol. Survey of India, vol. 76, Bull. 12, 31 pp. (reprinted 1946); Jour. Am. Ceram. Soc., vol. 33, No. 7, July 1950, p. 150 (abs.).
[24] South African Mining and Engineering Journal, vol. 61, pt. 1, No. 2985, Apr. 29, 1950, p. 275.
[25] Mining Engineering, vol. 187, No. 1, January 1950, pp. 68–69.
[26] Rock Products, Montana Corundum Deposit: Vol. 53, No. 2, February 1950, p. 124.
[27] Georgia Mineral Society, News Letter, vol. 3, No. 2, March–April 1950, p. 48.
[28] American Ceramic Society Bull., vol. 29, No. 4, April 1950, p. 166.

Prices of imported corundum are not quoted in the domestic press. Average value of corundum ore imported in 1950, as shown in the import statistics, was $54.88.

Quotations on natural corundum grain in 1950, as given in the E&MJ Metal and Mineral Markets, were as follows: Per pound, sizes 8 to 60, inclusive, 8½ cents; 70–275, inclusive, 9½ cents; 500, 28 cents; 850, 43 cents; 1,000, 45 cents; 1,200–1,600, 65 cents; and 2,600, 70 cents.

TABLE 15.—World production of corundum, 1943–50, by countries, in metric tons [1]

[Compiled by Helen L. Hunt]

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
Argentina	--	30	70	(2)	(2)	(2)	(2)	(2)
Australia (New South Wales)	--	--	[3] 10	--	--	--	--	(2)
Belgian Congo	--	[4] 5	--	--	--	--	--	(2)
Brazil	--	[5] 100	(2)	(2)	(2)	(2)	(2)	(2)
Canada [6]	--	157	1,195	673	--	--	--	(2)
French Equatorial Africa	--	[5] 2	142	46	3	--	--	--
India	110	349	409	97	182	284	1,493	(2)
Madagascar	14	70	50	21	1	4	(2)	(2)
Mozambique	834	1,108	152	--	--	6	(2)	(2)
Nyasaland	180	305	328	379	--	--	113	(2)
Southern Rhodesia	44	--	--	13	--	114	--	--
Swaziland	141	--	--	--	--	--	--	--
Tanganyika	7	--	--	--	--	--	(2)	(2)
Union of South Africa	4,270	3,531	4,379	1,854	2,313	2,537	2,464	3,201
United States (sales)	(7)	(7)	--	--	--	--	--	--
Total (estimate) [1]	5,625	5,700	6,900	3,250	2,700	3,100	4,200	3,700

[1] In addition to countries listed, corundum probably is produced in U. S. S. R., but data on production are not available; estimate is included in the total.
[2] Data not available; estimate by author of the chapter included in total.
[3] Reported as corundum and emery (believed to be largely emery).
[4] Imports into the United States.
[5] Estimate.
[6] Recovered from tailing dumps.
[7] Bureau of Mines not at liberty to publish figure, but total includes United States production as measured by sales.

Emery.—Production of emery for sale in 1950 increased to 5,949 short tons valued at $75,308, or 21 percent more in quantity and 24 percent more in value than in 1949. The producers of emery in the United States in 1950, as in recent years, were Joe DeLuca and DiRubbo & Ellis, both of Peekskill, N. Y. Because of its marked resistance to wear, a large part of the domestic output is used as a nonskid agent in concrete floors and steps. The balance is consumed for abrasive purposes, such as the manufacture of emery cloth, grinding wheels, and similar products. The sales since 1920 are presented graphically in figure 2. The use of natural emery versus manufactured abrasives was discussed in a trade journal.[29]

As quoted in E&MJ Metal and Mineral Markets, the price in 1950 of domestic crude ore, first grade, was $12 a ton f. o. b. New York. Grain emery in 1950 (f. o. b. Pennsylvania, in 350-pound kegs) was 10 cents a pound for Turkish and Naxos grain and 6½ cents a pound for American grain.

[29] Perrett, J. S., Natural Emery versus Manufactured Abrasives: Electroplating, vol. 3, No. 11, July 1950, pp. 408–409.

TABLE 16.—Emery sold or used by producers in the United States, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	7,856	$75,977	1948	5,405	$69,408
1946	6,188	62,099	1949	4,909	60,917
1947	5,798	66,927	1950	5,949	75,308

INDUSTRIAL DIAMONDS

The world production of industrial diamonds in 1950 was approximately 12,590,000 carats, an increase of 15 percent over 1949. Of this amount some 9,900,000 carats was mined in the Belgian Congo. None were produced in the United States.

The total imports into the United States of all classifications of industrial diamonds in 1950 were 10,967,005 carats, valued at $35,445,506, an increase of 72 percent by weight and 100 percent in value over the 1949 figures. (*See* fig. 3.)

The United States Government continued to purchase industrial diamonds of all classes for the National Stockpile.

The cost of industrial diamonds increased materially during 1950. This was discussed in trade journals.[30]

The largest consumers of industrial diamonds in the United States continued to be the manufacturers of diamond grinding wheels. Expanding use of cemented-carbide cutting tools increased the demand for these wheels, and their successful application for glass grinding and concrete cutting have further extended their use in industry. Manufacturers have improved and expanded their production, and diamond grinding wheels are now available in vitrified, metal, and resin bonds. These wheels are now considered indispensable for many purposes, and cost cutting through their use has been described.[31]

Increased demand for wires of fine diameter during 1950 stimulated the production of diamond wire-drawing dies in this country.

Improved diamond-bit heads for oil-field drilling, as well as improved drilling techniques, have led to lower costs per foot drilled and have brought about an increase in use of diamond bits in that branch of industry.[32]

Diamond dressing and truing tools continue to represent the main use for whole, sound industrial stones. New methods have been developed for automatically controlling the area of contact between diamond and grinding wheel. Indexing devices by which a new diamond face is presented to the wheel after each dressing has permitted maintenance of correct angles and edges on the diamond. The results have been longer diamond life and an improved surface of the grinding wheel that has been dressed. The use of diamonds in dressing and truing grinding wheels has been explained.[33] There have been wider

[30] National Jeweler, vol. 45, No. 1, January 1950, p. 84; Mining Jour., vol. 234, No. 5975, Feb. 24, 1950, p. 189.

[31] Larson, E. T., Some Cost-Cutting Pointers on Grinding Carbide Tools: Grits and Grinds, vol. 41, June 1950, pp. 1–5; Victory, F. C., Accurate Grinding of Carbide Dies: Ind. Diamond Rev., vol. 10, No. 115, June 1950, p. 187.

[32] Smit, J. K., Review of the Industrial Diamond Market: Mining Jour., vol. 234, No. 5975, Feb. 24, 1950, p. 192.

[33] Allen, R., Dressing and Truing Grinding Wheels: Machinist, vol. 94, No. 25, June 24, 1950, p. 961.

applications for diamond tools, the scope of which is increasing in harmony with the general improvement in grinding practices. The methods of setting diamond tools have been summarized.[34]

The use of diamond powder, due to improvements in the technique of manufacture, expanded during the year. Modern production calls for high and rapid finish of many mechanical products, which is now made practical with closely graded diamond powder. The United States Bureau of Standards has set up Commercial Standards C. S. 123–49 governing diamond powders.

Diamond compounds have found an expanded market in the finishing of plastic molds, die-casting dies, production lapping, and in the manufacture of gages and precision parts.

Diamond dental tools are becoming more popular.

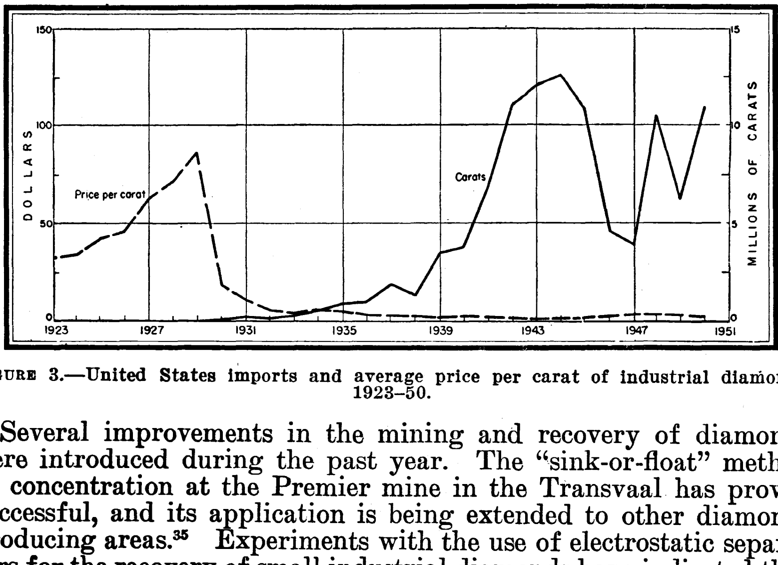

FIGURE 3.—United States imports and average price per carat of industrial diamonds, 1923–50.

Several improvements in the mining and recovery of diamonds were introduced during the past year. The "sink-or-float" method of concentration at the Premier mine in the Transvaal has proved successful, and its application is being extended to other diamond-producing areas.[35] Experiments with the use of electrostatic separators for the recovery of small industrial diamonds have indicated that material previously lost by existing methods can be saved.[36]

The Beceka mine in the Belgian Congo has expanded its production by recent extensive mechanization. A geophysical examination of the property indicates the occurrence of a mass of diamantiferous kimberlite that suggests the outcropping of a kimberlite pipe.[37]

Economic Cooperation Administration assistance to diamond producers in French Equatorial Africa has enabled two companies to mechanize their operations, thus increasing their production of industrial diamonds.[38]

---

[34] Stauss, H. L., Jr., Metallurgical Materials and Problems of Setting Industrial Diamonds: Ind. Diamond Rev., vol. 10, No. 115, June 1950, pp. 184–185.

[35] Mining Magazine, London, Diamond Recovery by Sink-Float: Vol. 83, No. 3, September 1950, pp. 184–186.

[36] Linari-Lindholm, A. A., Recovery of Diamonds by Electrostatic Separation: Mining Jour., vol. 235, No. 6013, Nov. 17, 1950, pp. 476–477.

[37] Mining Journal, vol. 234, No. 5977, Mar. 10, 1950, pp. 236–237.

[38] Mining World, vol. 12, No. 8, July 1950, p. 45; Nat. Jeweler, vol. 45, No. 9, September 1950, p. 94.

TABLE 17.—Industrial diamonds (including diamond dust and manufactured bort) imported into the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	Bort, manufactured (diamond dies)		Bort (glaziers' and engravers' diamonds, unset, and miners')		Carbonado and ballas		Dust	
	Carats	Value	Carats	Value	Carats	Value	Carats	Value
1949								
Angola			125	$788				
Australia			4,403	13,932				
Belgian Congo			2,345,986	4,175,171			426	$616
Belgium-Luxembourg			8,250	10,238				
Brazil			23,002	235,743	4,917	$56,694		
British Guiana			423	3,598				
British West Africa, n. e. s.			19,284	115,905				
Canada			11,670	60,404				
France	749	$54,152						
French Equatorial Africa			50	1,115				
French Morocco			540	7,636				
Gold Coast			5,694	31,848			923	3,280
Indonesia			1,887	23,824				
Israel			356	1,221				
Netherlands	311	25,798	12,219	54,670				
Netherlands Antilles			104	2,701				
Switzerland			74	14,270				
Union of South Africa			3,537,050	11,617,569	287	751	46,601	127,981
United Kingdom			301,218	940,475			53,350	118,433
Venezuela			1,557	23,735				
Total	1,060	79,950	[1] 6,273,892	[1] 17,334,843	5,204	57,445	101,300	250,310
1950								
Belgian Congo			5,626,622	10,345,266			8,700	16,723
Belgium-Luxembourg	110	3,600	74,033	353,418			24,155	11,700
Brazil			80,991	549,528	3,174	50,506		
British Guiana			803	7,815				
British Malaya			18,140	22,926				
British West Africa			22,901	122,650			3,466	9,607
Canada			46,346	176,429				
France	1,755	99,149	160	3,013			19,309	14,235
French Equatorial Africa			37	98				
French Guiana			753	5,796				
Germany	28	1,210						
Israel			1,600	3,919			5,325	4,424
Netherlands	720	69,223	21,769	164,357			29,000	44,278
Switzerland	12	643	2,377	30,593				
Union of South Africa			4,449,061	21,658,361			19,685	70,959
United Kingdom	69	1,731	485,327	1,550,037			19,075	35,920
Venezuela			1,502	17,392				
Total	2,694	175,556	10,832,422	35,011,598	3,174	50,506	128,715	207,846

[1] Revised figure.

TABLE 18.—Industrial diamonds (excluding diamond dust and manufactured bort) imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Carats	Value		Year	Carats	Value	
		Total	Average			Total	Average
1945	10,733,411	$12,823,962	$1.19	1948	10,421,207	$32,581,385	$3.13
1946	[1] 4,652,639	[1] 14,406,137	[1] 3.10	1949	[1] 6,279,096	[1] 17,392,288	2.77
1947	3,999,119	13,312,668	3.33	1950	10,835,596	35,062,104	3.24

[1] Revised figure.

Increased production of industrial diamonds from the Union of South Africa is indicated by the reopening of the Premier Mine in the Transvaal[39] and the New Jagersfontein mine in the Orange Free State.[40]

A possible application of atomic energy for increasing the hardness of diamonds has been described.[41]

No production of diamonds was reported from Arkansas during 1950.

ARTIFICIAL ABRASIVES

The combined tonnage of aluminum oxide and silicon carbide manufactured in the United States and Canada in 1950 increased 6 percent, and its value increased 32 percent over the 1949 production. Aluminum oxide showed a 12-percent increase in tonnage and 41-percent in value. The figure for aluminum oxide for 1950 includes 20,188 short tons of "white high-purity" material valued at $2,607,590, compared with 10,858 short tons valued at $1,178,290 in 1949, an increase of 86 percent in quantity and 121 percent in value. The tonnage of aluminum oxide used for refractories in 1950 was 2 percent compared with 3 percent in 1949. Production of silicon carbide showed a slight loss for 1950, being 4 percent less than 1949, but its value increased 21 percent. The percentage of the silicon carbide used for refractories was 24 in 1950, the same as in 1949.

TABLE 19.—Crude artificial abrasives produced in the United States and Canada, 1946–50

Year	Silicon carbide [1]		Aluminum oxide [1] (abrasive grade)		Metallic abrasives [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	63,849	$5,457,903	132,084	$8,367,158	111,512	$6,387,819	307,445	$20,212,880
1947	63,724	5,633,811	160,022	10,158,432	154,191	12,449,855	377,937	28,242,098
1948	63,033	5,874,731	154,972	10,279,583	147,218	15,174,773	365,223	31,329,087
1949	67,539	6,055,763	125,806	8,500,074	104,778	9,312,368	298,123	23,868,205
1950	65,004	7,303,671	140,352	11,958,035	144,333	11,699,764	349,689	30,961,470

[1] Bureau of Mines not at liberty to publish data for United States separately. Figures include a small quantity used for refractories and other nonabrasive purposes.
[2] Shipments from United States plants only.

The output of metallic abrasives in the United States alone in 1950 increased 38 percent in quantity and 26 percent in value over 1949. Stocks of aluminum oxide decreased 56 percent, silicon carbide 60 percent, and metallic abrasives 28 percent from the 1949 figures. The ratio of production to annual plant capacity of silicon carbide in 1950 was 77 percent, 6 percent less than in 1949. However, the ratio for aluminum oxide was 59 percent, an increase of 6 percent; and for metallic abrasives 69 percent, an increase of 23 percent.

[39] Mining World, vol. 12, No. 4, April 1950, pp. 47–49.
[40] Mining Mag., London, vol. 82, No. 1, January 1950, p. 36.
[41] Chemical Age, Increasing the Hardness of Diamonds: Vol. 62, No. 1596, Feb. 11, 1950, p. 232.

TABLE 20.—Stocks of crude artificial abrasives and capacity of manufacturing plants, as reported by producers in the United States and Canada, 1946–50, in short tons

Year	Silicon carbide		Aluminum oxide		Metallic abrasives [1]	
	Stocks, Dec. 31	Average annual capacity	Stocks, Dec. 31	Average annual capacity	Stocks, Dec. 31	Average annual capacity
1946	5,339	71,679	27,072	232,889	6,524	211,407
1947	3,524	72,350	32,977	233,500	9,987	245,479
1948	5,387	73,250	34,177	233,500	9,907	240,129
1949	21,964	81,121	49,505	237,072	10,144	231,650
1950	8,766	84,398	22,025	238,500	7,291	209,850

[1] Figures pertain to United States plants only.

The production of aluminum oxide in the United States and Canada is largely concentrated in the Niagara Falls area. The remainder is at Anniston, Ala., and Arvida, Quebec. The larger part of the silicon carbide production is also in the Niagara region, with plants at Vancouver, Wash., and Cap-de-la-Madeleine and Shawinigan Falls, Quebec, manufacturing the remainder.

Statistics regarding metallic abrasives include those for steel shot and grit but not for steel wool, and pertain to shipments from United States plants only. During 1950, production was reported by 14 companies, totaling 16 plants. The States reporting the largest production were Michigan, Ohio, and Pennsylvania. Smaller quantities were produced in Illinois, New Hampshire, and New York.

The Carborundum Co. has begun operations at its new plant at Vancouver, Wash. The crude silicon carbide abrasive produced will be shipped to the eastern plants of the company for conversion into abrasive or refractory products.[42] The Grinding Wheel Institute, Greendale, Mass., publishes information on grinding wheels and bonded abrasives.[43]

The properties and applications of silicon carbides were reviewed in a trade journal.[44] Other articles published in 1950 discussed methods of manufacturing alumina for abrasive purposes,[45] abrasive costs and ways of reducing them,[46] toolroom grinding problems,[47] and the use of abrasives for surface-finishing stainless steel.[48] Still other articles outlined the history, manufacture, and industrial applications of coated abrasives [49] and summarized the physical, mechanical, and chemical properties of abrasives.[50] The use of glycerin in connection with diamond powder and other abrasives was recommended to make the final product more adaptable for certain functions.[51]

[42] Ceramic Age, vol. 55, No. 1, January 1950, p. 15.
[43] Lindsay, H. B., How One Industry Keeps Users Up to Date: Standardization, vol. 21, No. 8, August 1950, pp. 204–205.
[44] Chemical and Engineering News, vol. 28, No. 23, June 5, 1950, p. 1954.
[45] Journal, American Ceramic Society, vol. 33, No. 6, June 1950, p. 132.
[46] Work, B. H., Trans. Am. Foundryman's Soc.: Preprint, 1950 (50–61), 7 pp.
[47] Hendrickson, B. D., Toolroom Grinding Problems: Grits and Grinds, vol. 41, No. 3, March 1950, pp. 1–8.
[48] Spencer, L. F., Iron Age, vol. 165, Nos. 10 and 11, Mar. 9 and 16, 1950, pp. 73–77, 82–85.
[49] Brown, A. E., Coated Abrasives: Electroplating, vol. 3, No. 16, December 1950, pp. 606–608.
[50] Grodzinski, P., Abrasives: Jour. Am. Ceram. Soc., vol. 33, No. 11, November 1950, p. 215.
[51] Ceramic Industry, vol. 54, No. 6, June 1950, p. 119.

The Attorney General's Office announced a consent judgment against four abrasives manufacturers (Minnesota Mining & Manufacturing Co., St. Paul, Minn.; Behr-Manning Corp., Troy, N. Y.; The Carborundum Co., Niagara Falls, N. Y.; Armour & Co., Chicago, Ill.) whereby to create opportunities for the entrance of new competitors in the coated abrasive industry more than 200 existing patents are made subject to compulsory licensing. The companies are required to furnish, to any applicant, written manuals describing the methods, processes, materials, and equipment used by the companies in their commercial production under the licensed patents.[52]

MISCELLANEOUS MINERAL-ABRASIVE MATERIALS

In addition to the natural and manufactured abrasive substances for which data are included herein, many other mineral materials are used for abrasive purposes. A number of oxides, including tin oxides, magnesia, iron oxides (rouge and crocus), cerium oxide, chromium oxide, and manganese oxide, are employed as polishing agents. Zircon silicate and calcined kaolin are suggested for polishing optical glass. Certain carbides, such as boron carbide and cemented carbides, which include tantalum carbide, titanium carbide, and tungsten carbide, have been used for their abrasive properties, especially when required for their extreme hardness or durability. Other substances with abrasive applications include finely ground and calcined clays, lime, talc, ground feldspar, river silt, slate flour, and whiting.

The methods of preparation and the physical properties of cerium were described in a technical publication.[53]

FOREIGN TRADE[54]

Imports.—The total value of imports for consumption of both natural and artificial abrasives during 1950 increased 78 percent over the 1949 figure. With a few minor exceptions, every abrasive product listed showed a marked increase. Imports of industrial diamonds increased 72 percent in weight and 100 percent in value, and crude aluminum oxide abrasives increased 30 percent in weight and 44 percent in value.

Exports.—The value of exports of natural and artificial abrasives in 1950 declined 7 percent compared with 1949. Diamond grinding wheels, however, showed an increase in value of 56 percent over 1949.

[52] Chemical and Engineering News, vol. 82, No. 48, Nov. 27, 1950, p. 4178.

[53] Eastman, E. D., Brewer, L., Bromley, L. A., Gilles, P. W., Lofgren, N. L., Preparation and Properties of Refractory Cerium Sulfides: Jour. Am. Chem. Soc., vol. 72, No. 5, May 1950, pp. 2248–2250.

[54] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 21.—Abrasive materials (natural and artificial) imported for consumption in the United States, 1948–50, by kinds

[U. S. Department of Commerce]

Kind	1948		1949		1950	
	Quantity	Value	Quantity	Value	Quantity	Value
Burrstones: Bound up into millstones short tons	1	$204	10	$897	3	$514
Grindstones, finished or unfinished short tons	307	19,882	143	7,998	297	13,586
Hones, oilstones, and whetstones short tons	42	73,619	16	23,366	19	26,398
Corundum (including emery):						
Corundum ore do	3,612	300,865	2,013	186,328	3,543	194,427
Emery ore do	1,102	11,350	1,512	20,294	1,726	21,560
Grains, ground, pulverized, or refined pounds	125,041	4,809	5,143	594	21,097	1,442
Paper and cloth coated with emery or corundum reams	1,368	180,743	718	88,044	18,552	193,305
Wheels, files, and other manufactures of emery or garnet pounds	4,963	6,504	15,217	17,101	15,542	12,657
Wheels of corundum or silicon carbide pounds	3,387	3,026	63	117	2,755	1,863
Garnet in grains, ground, etc do	3,101	578			6,181	159
Tripoli or rottenstone short tons			(1)	808	(1)	68
Pumice:						
Crude or unmanufactured do	8,475	85,370	8,843	79,804	19,268	125,726
Wholly or partly manufactured short tons	780	18,979	756	19,121	982	18,356
Manufactures, not separately provided for				694		953
Diamonds:						
Bort, manufactured carats	613	69,024	1,060	79,950	2,694	175,556
Bort (glaziers' and engravers' diamonds, unset, and miners') carats	10,360,371	31,738,956	[2] 6,273,892	[2] 17,334,843	10,832,422	35,011,598
Carbonado and ballas do	60,836	842,429	5,204	57,445	3,174	50,506
Dust do	226,430	618,265	101,300	250,310	128,715	207,846
Flint, flints, and flintstones, unground short tons	11,193	269,935	7,554	165,290	34,802	187,113
Grit, shot, and sand, of iron and steel pounds	51,787	2,409	785,308	33,771	2,707,274	281,067
Artificial abrasives:						
Crude, not separately provided for:						
Carbides of silicon (carborundum, crystalon, carbolon, and electrolon) pounds	101,149,211	3,823,239	78,566,074	3,126,125	79,862,853	3,377,890
Aluminous abrasives, alundum, aloxite, exolon, and lionite pounds	247,426,381	7,010,348	179,502,573	4,849,980	234,208,185	7,003,527
Other do	498,838	18,407	883,297	27,884	2,225,600	73,008
Manufactures:						
Grains, ground, pulverized, refined, or manufactured pounds	207,410	32,220	139,090	15,241	761,849	80,791
Wheels, files, and other manufactures, not separately provided for pounds	61,178	33,908	4,065	3,389	28,372	11,354
Total		45,165,069		[2] 26,389,394		47,071,270

[1] Less than 0.5 ton.
[2] Revised figure.

TABLE 22.—Abrasive materials (natural and artificial) exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Grindstones and pulpstones		Diamond dust		Diamond grinding wheels		Other natural, artificial, and metallic abrasives, and products[1] (value)	Total value
	Pounds	Value	Carats	Value	Pounds	Value		
1946	6,135,719	$285,799	116,650	$146,490	4,398	$95,205	$13,908,147	$14,435,641
1947	4,591,080	217,747	122,925	324,572	13,217	212,074	20,199,815	20,954,208
1948	2,887,995	131,725	52,600	80,352	11,562	270,929	14,784,664	15,267,670
1949	1,407,680	82,090	55,637	133,917	10,285	321,936	16,909,456	17,447,399
1950	1,027,599	55,283	58,563	126,089	12,807	502,523	15,504,887	16,188,782

[1] Exclusive of steel wool.

Aluminum

By Delwin D. Blue

GENERAL SUMMARY

DEMAND for aluminum rose steadily during 1950, not only in the United States but throughout the industrialized countries of the world. The chief cause of this larger demand was increased military requirements arising from accelerated rearmament programs. Other contributing factors were the wider application of aluminum in both civilian and military goods as a result of improvements in alloying and fabrication technology and the substitution of aluminum for other nonferrous metals whose possibilities of expanded production were more limited. During the latter part of the year it became evident that supplies of aluminum were inadequate to meet miltiary and civilian requirements.

Domestic production of primary metal for 1950 was the largest since the peak war years 1943–44; imports increased, exports decreased, and secondary recovery was maintained at a high level. Although the total supply of aluminum was greater than in any previous year but 1943, it became necessary for the primary producers to inaugurate a system of voluntary allocations during the last half of the year. On November 13 the National Production Authority of the United States Department of Commerce issued NPA Order M–7, which established quotas for consumption of aluminum in nonmilitary uses.

TABLE 1.—Salient statistics of the aluminum industry, 1945–50

	1945	1946	1947	1948	1949	1950
Primary production short tons	495,060	409,630	571,750	623,456	603,462	718,622
Value	$140,864,000	$115,812,000	$161,626,000	$180,755,000	$190,303,000	$235,977,000
Quoted price per pound cents	15.0	15.0	15.0	15.7	17.0	17.7
Secondary production short tons	298,387	278,073	344,837	286,777	180,762	243,666
Imports	$99,370,633	$12,463,960	$6,603,722	$42,203,519	$36,815,965	$68,565,400
Exports	$9,906,041	$20,284,053	$52,231,972	$43,219,940	$32,924,653	$22,153,000
World production short tons	958,000	870,000	1,189,000	1,398,000	1,442,000	1,631,000

The increased production required was variously estimated at 500,000 to 1,000,000 tons per year. The initial expansion program formulated by the Government in 1950 called for construction of 446,000 tons per year of new capacity. The goal of this program was an aluminum supply sufficient to meet all military requirements plus civilian requirements. Under authority of the Defense Production Act of 1950 (Public Law 774) negotiations were under way at the end of the year between the Government and five private companies for construction of new plants. Full production from the new facilities was expected to be attained by the latter part of 1952.

PRODUCTION

The total output of aluminum in the United States for 1950 was about 1,000,000 tons, of which 75 percent was primary metal produced from bauxite ores, 17 percent secondary from plant scrap, and 8 percent secondary from old scrap. United States primary production accounted for 44 percent of the estimated world total.

Primary.—Domestic production of primary aluminum was 718,622 short tons during 1950, 19 percent more than in 1949. Except for the usual seasonal variation, monthly production increased throughout 1950. Output for the first quarter was 161,200 tons compared to 191,000 tons for the fourth quarter. The average monthly production rate was 59,885 tons, the highest attained by the industry since August 1944.

These primary production data represent output from the reduction cell. They include a small quantity of alloying constituents that are sometimes introduced into the cell feed and recovered with the aluminum.

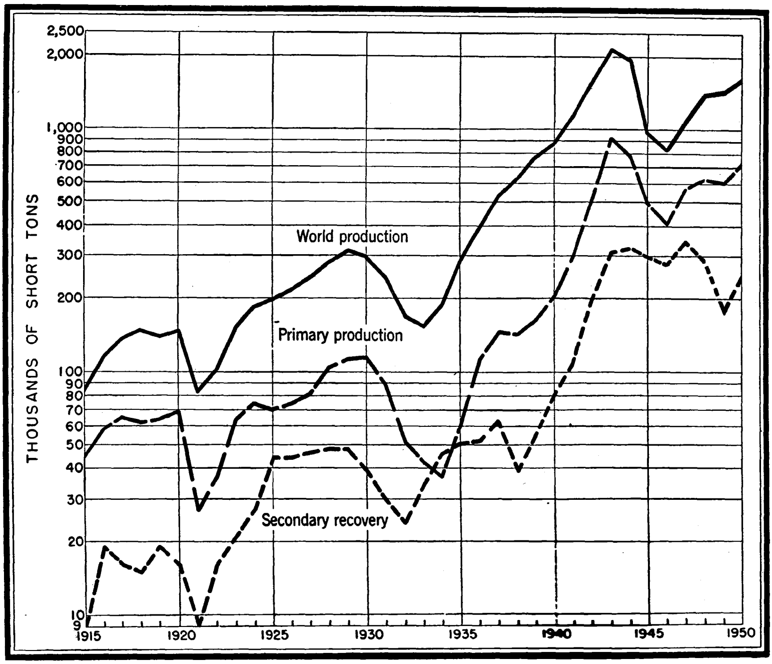

Figure 1.—Trends in world and domestic primary production and domestic secondary recovery of aluminum, 1915–50.

All of the primary aluminum in 1950 was produced by 3 companies, operating 11 reduction plants; the Aluminum Co. of America produced 49 percent, Reynolds Metals Co., 31 percent, and Kaiser Aluminum and Chemical Corp., 20 percent of the total.

A new reduction plant at Point Comfort, Tex., was put in operation in February by the Aluminum Co. of America. A strike closed this plant during the latter part of August and all of September; the rate of production attained in July had not been reached again by the end of the year. Two potlines at Reynolds' Jones Mills reduction plant were reopened—the first in April and the second in September. These facilities had been idle since 1944 except for a 4-month period in 1949 when one line was in operation. Aluminum-reduction facilities at Massena, N. Y., and Badin, N. C., which had been idle in recent years because of high power cost, were reactivated by the Aluminum Co. of America at the close of 1950. These new and reactivated facilities accounted for approximately one-third of the total increase in production; the remainder was a result of maintaining high-level production at previously operating facilities.

Operable reduction capacity of the aluminum industry at the year end was rated at approximately 750,000 tons annually, exclusive of the 105,000 tons of capacity available at Badin, N. C., Massena, N. Y., and Listerhill, Ala., which could be operated only by using high-cost power. This capacity was distributed as follows: The Aluminum Co. of America 50 percent, Reynolds Metal Co., 29 percent, and the Kaiser Aluminum & Chemical Corp., 21 percent.

During the latter part of the year it became evident that a large expansion in production facilities was required to meet the increasing demand for aluminum. Requirements for civilian consumption increased steadily during the first half of the year, civilian demand being estimated at 1,000,000 tons of primary and secondary metal annually. The new facilities required to satisfy these demands, meet military requirements, and leave a surplus for stockpiling were variously estimated at 500,000 to 1,000,000 tons of production capacity per year. Enactment of the Defense Production Act of 1950 (Public Law 774) in September enabled the Government to offer the following incentives to industry for expanding production: Accelerated amortization for tax purposes, guaranteed loans, subsidies to offset excess cost of power, and a guaranteed market for metal produced from the new facilities.

Negotiations, based on these incentives, were underway at the end of the year between the Government and five concerns for the construction of new aluminum-production facilities. These new facilities were to have an aggregate capacity of 446,000 tons of metal per year, full output to be reached during the latter part of 1953. Participating companies were the three established producers—Alcoa, Reynolds, and Kaiser—and two new concerns, Harvey Machine Co. of Torrence, Calif., and the Apex Smelting Co. of Chicago, Ill. The new capacity was to be distributed as follows: 120,000 tons to Alcoa for a 35,000-ton expansion of the Point Comfort, Tex., plant and construction of an 85,000-ton plant at Wenatchee, Wash.; 100,000 tons to Reynolds for a 25,000-ton expansion at the Jones Mills, Ark., plant and a new 75,000-ton plant at Corpus Christi, Tex.; 100,000 tons to Kaiser for a new plant to be constructed at Chalmette, La.; 72,000 tons to Harvey Machine Co. for a new plant at Kalispell, Mont.; and 54,000 tons to Apex Smelting Co. for a new plant, the location of which was undetermined. Under the expanded program the capacity would be, Alcoa 45 percent, Reynolds 25 percent, Kaiser 20 percent and new producers, 10 percent.

The main problem the industry faced in effecting this expansion was that of adequate low-cost power, about 1,000,000 kilowatts of which were required. The largest potential source immediately available was the natural gas of the Texas Gulf region, which could either be used directly for operation of gas Diesel engines, as at Point Comfort, or for generating steam for turbine-driven generators. Consideration was also given to generation of power by combustion of coal. The Harvey Co. planned to use hydroelectric power from the Hungry Horse Dam being built by the Bonneville Power Administration in western Montana.

Bauxite for the expansion was available through development of Jamaica deposits by Reynolds and Kaiser and increased imports from Surinam.

Alumina facilities for supplying the new reduction facilities were to be constructed by the producing companies. Alcoa had plans to increase the capacity of its Mobile, Ala., and East St. Louis, Ill., plants and to construct a new plant at Bauxite, Ark. Kaiser intended to produce its additional alumina requirements by expanding facilities at Baton Rouge, La. Reynolds planned expansion of their Hurricane Creek alumina plant and had under consideration construction of a new alumina plant on the Gulf coast, specially designed for treating Jamaica ores. Location of alumina facilities of new producers had not been determined.

Secondary.—Domestic recovery of aluminum from secondary sources was 243,666 tons in 1950, a 35-percent increase over 1949. A major factor contributing to the increased secondary supply was the high market price of secondary ingot; bid prices for secondary ingot went from 17.2 cents per pound in January to 31.2 cents in December 1950.

Secondary aluminum was recovered by the three primary producers, about 60 secondary smelters, and several thousand foundries and other manufacturers. Of the total, 69 percent was recovered from processing new (plant) scrap and 31 percent from old scrap. (Home scrap generated and reused in the same plant is not included.) The secondary product was marketed as aluminum ingot, aluminum alloys, and for use in deoxidizers, hardeners, chemicals, and other miscellaneous products.

Detailed information regarding secondary aluminum in 1950 is given in the Secondary Metals—Nonferrous chapter of this volume.

SUPPLY

The total supply of aluminum pig and ingot and ingot equivalent of scrap aluminum in the United States for 1950 was 1,198,847 tons, the largest in history except for the peak war year 1943. This supply comprises primary production, secondary recovery from both old and new scrap, net imports of pig and ingot, and the ingot equivalent of net imports of scrap aluminum. Home scrap (scrap used in the plant of generation) and changes in stocks of producers, consumers, and the National Stockpile are not included in this total. Metal recovered from new scrap, which result from fabrication operations, does not represent additional aluminum production but does represent a new supply for the manufacturers of aluminum ingots and for use in hardeners, deoxidizers, chemicals, etc. When aluminum requirements are expressed in terms of the equivalent weight of aluminum ingot, the usual method, secondary aluminum from new scrap must be included in the supply available for meeting these requirements.

The pattern of the sources of this aluminum supply has shown considerable variation from year to year over the past decade, as shown in figure 2. Before the war almost three-quarters of the supply was from primary production. In the 5 years since the war (1946–50) the average contribution of primary production has been 61 percent. Both imports and secondary production have increased in relative importance.

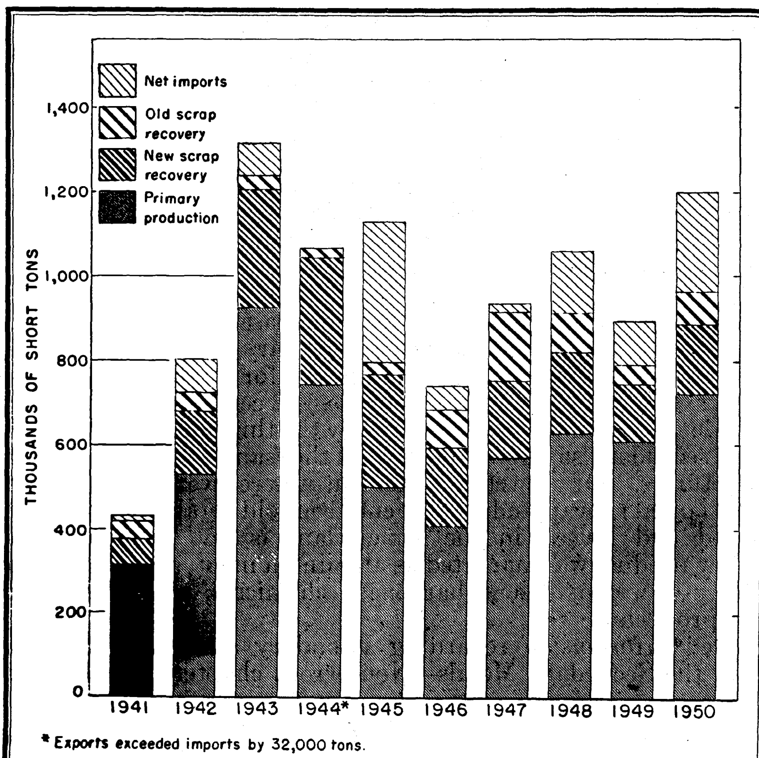

FIGURE 2.—Sources of United States aluminum, 1941–50; imported scrap converted to ingot equivalent.

CONSUMPTION

Apparent consumption of primary aluminum in 1950 was 898,336 short tons, as computed by adding primary production and net imports of ingots, slab, plate, sheet, bars, and other crude or semifabricated forms and adjusting for producers' stock changes. This total includes aluminum that went to the National Stockpile. Data on stocks of primary aluminum at fabricators and other consumers are not available, and no allowance has been made for stock changes other than at primary production plants.

Secondary aluminum for consumption was obtained from domestic recovery and from imported scrap. Imported scrap aluminum is largely in pig form for easier handling and shipping. Aluminum contained in imported "loose" scrap is also included in domestic secondary recovery, but since this type of material represents a small portion of the total imports, the net scrap imports must be considered as an additional supply. The recovery of aluminum from scrap is calculated at 90 percent.

TABLE 2.—Apparent consumption of primary aluminum and ingot equivalent of secondary aluminum in the United States, 1945–50, in short tons

Year	Primary			Secondary		
	Sold or used by producers	Imports (net)[1]	Apparent consumption[2]	Domestic recovery: From old scrap	Domestic recovery: From new scrap	Imports (net)[3]
1945	468,836	328,216	696,750	27,311	271,076	3,929
1946	435,964	25,913	575,687	90,535	187,538	12,468
1947	570,923	−46,964	571,789	163,847	180,990	13,412
1948	625,834	40,041	684,575	95,648	191,129	64,165
1949	587,532	48,424	635,956	44,596	136,166	35,751
1950	731,087	167,249	898,336	76,358	167,308	60,443

[1] Crude and semifabricated, excluding scrap. May include some secondary.
[2] For 1945–48, apparent consumption modified by changes in stocks held by the Office of Metals Reserve.
[3] Ingot equivalent of net imports (wt. × 0.90). Imports are largely scrap pig. Some duplication of secondary aluminum occurs because of small amount of loose scrap imported which is included as secondary recovery rom old scrap.

Shipments of aluminum products by intermediate producers, as reported by the Bureau of Census, totaled 1,071,150 short tons; 226,305 tons were shipped as castings and 844,845 tons as wrought products.[1] Aluminum consumed in various "dissipative" uses (such as deoxidizers, hardeners, and chemicals) and as a minor alloying agent in other base-metal alloys was not reported. Data on changes in consumers' stocks were not available.

During 1950 the demand for aluminum increased steadily; consumption was limited by the supply. In July a system of voluntary allocations was inaugurated by some of the primary producers. On October 27, 1950, the National Production Authority in the U. S. Department of Commerce issued N. P. A. Order M–5 which set rules for placing, accepting, and scheduling rated orders for aluminum. On November 13, N. . A. Order M–7 was issued, prescribing the dis-

[1] Bureau of the Census, Facts for Industry: Series M24–1–120, Feb. 12, 1951.
Bureau of the Census, Facts for Industry: Series M24E–120, Feb. 21, 1951.

tribution and uses of metal available after allowing for the requirements of national defense and allocations to the stockpile. This order established quotas for consumption of aluminum based on the average rate of consumption during the base period, which was fixed as the first 6 months of 1950. Each consumer was restricted in his 1950 consumption to 100 percent of the base-period rate and for his consumption after December 31, 1950, to 65 percent of the base-period rate. Amended order M-7 was issued on December 1 and provided for a gradual restriction of use to 80 percent in January, 75 percent in February, and 65 percent in March 1951 and thereafter. Provisions were made for adjusting the base rate when a business operation was started during the base period or when the restriction could be shown to impose an undue hardship not suffered by others in the same trade.

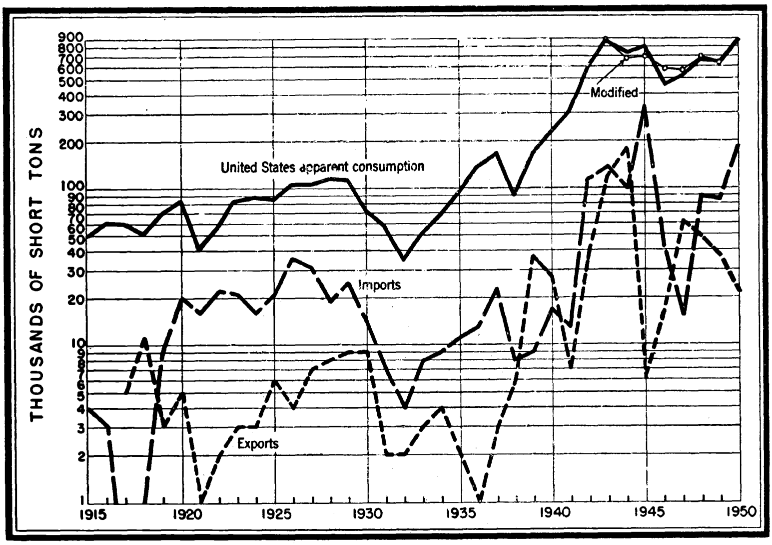

FIGURE 3.—Trends in imports, exports, and apparent consumption of aluminum, 1915–50. Imports and exports do not include scrap.

USES

Uses for aluminum in 1950 followed the general pattern noted in **postwar years.** Data are not available for all producers, but Alcoa **shipments** indicate that major changes in the consumption pattern as **compared with** 1949 were lower consumption for electrical power **transmission and** an increase for transportation facilities. Building **materials and** transportation facilities were the largest consumers of **aluminum.** Shipments made by Alcoa to various industries were **distributed as follows:**

	Percent
Building products	19
Transportation (all forms)	18
Power transmission	8
Household appliances	8
Cooking utensils	6
Machinery (general and electrical)	4
Unclassified fabricators	23
Other uses	14

The major military uses of aluminum are military aircraft, airborne equipment, and ship construction, but its use is being extended to such other equipment as bridges, radar towers, rockets and rocket-launching equipment, fire-control towers, portable shelters, fuel pipe, and other portable miscellaneous equipment used by ground troops. The new 35-inch-bore bazooka for antitank rockets requires 13 pounds of aluminum.

Improvements in fabrication techniques resulted in wider applications and lower costs for aluminum products.

The development of the Marform process for producing stampings and deep-drawn parts has resulted in large savings in fabrication costs and is particularly applicable when a limited number of parts are produced. In this process, the female die is replaced by a rubber pressure pad which forces the sheet aluminum to follow the contours of a male die when pressure is applied. The process makes possible forming the same shape from sheets of different thickness without changing the dies. Complex stampings can be manufactured by this process.[2]

Stretch-wrap-forming fabrication techniques came into wider use during 1950. This method of forming metal has become a necessity in all shops where parts, sheet, and extrusions must be contoured. Stretch forming is done by equipment that grips the edges of sheet metal and stretches it over a die machined to the proper contours. When the pressure is released the pressed part retains the shape of the male die. No female die is required. Large sections, such as leading edges of aircraft wings and rudders, are formed by this process.

Techniques used in welding, brazing, and soldering aluminum alloys were improved, and their application was expanded. Inert-gas-shield arc and flame welding achieved wider commercial application. The continuous-wire-feed Heliarc process implements the welding of heavy sections by using the V technique in common use in steel welding. The edges to be welded are "veed" out, and the cavity is filled with metal from the wire feed. During 1950 Alcoa developed new filler-wire alloys which provide high tensile strength and good ductility in the welds.

The Koldweld process for joining thin metal sections was developed by General Electric, Ltd., in England and was being handled in this country by the Koldweld Corp. The process consists of effecting a weld between specially prepared metal surfaces by applying high pressure and is applicable for welding aluminum to aluminum and aluminum to other malleable metals. Welding is limited to relatively thin sections. Application of this process should result in better and cheaper closures for sheet-metal fabrications.[3]

Improvements in brazing alloys and techniques have led to the development of new methods for making cast-aluminum assemblies. Experimental automobile engines have been built of aluminum parts joined by this new method. In 1950 Alcoa developed a new aluminum

[2] Schulze, R. Burt, Deep and Tapered Stampings Without Wrinkles: Metal Prog., vol. 57, No. 6, June 1950, pp. 769–772.

[3] Light Metals Age, Further Developments in the Koldweld Process: Vol. 8, Nos. 9 and 10, October 1950, pp. 16–17.

soldering flux that has a greater soldering activity and allows higher soldering temperatures than previous fluxes. This flux is now used in fastening aluminum incandescent-lamp bases.

Process developments in casting aluminum alloys have resulted in increased economies, larger and more complex castings, and smooth, dimensionally accurate castings. The plaster-mold casting process developed in 1948 permitted commercial production of intricate aluminum castings for automobile torque converters,[4] and its usage has been expanded for production of various aircraft parts and other castings requiring close dimensional tolerances. An example of the large, complex die castings that can be made of aluminum is the experimental inner door frame developed and cast by the Doehler-Jarvis Corp. in collaboration with the Kaiser-Frazier Corp.[5] This casting covers an over-all dimensional area of 1,200 square inches and weighs slightly over 12 pounds when trimmed. The die used in making the door weighed approximately 13 tons and the trimming die over 4 tons. Regarding die-casting usages in the future Doehler said, "We recognize only the limitations of the designer's imagination. Applications in the manufacture of refrigerators, metal furniture, radio and television receivers, as well as many more automobile parts are well within our vision".[6]

Numerous processes and improvements for finishes on aluminum alloys were reported in 1950. Alcoa developed a new alloy for applications that require a bright Aluminite finish with a minimum of structural streaks.

STOCKS

During 1950 inventories of primary producers and secondary smelters were reduced to a minimum. Stocks held by primary producers decreased from 29,101 tons at the close of 1949 to 16,636 at the end of 1950. Stocks at secondary smelters decreased from 16,478 short tons to 9,215.

Aluminum held at primary and secondary smelters is not significant as a reserve source of metal, since it is equivalent to less than 2 weeks' production and represents only a necessary operating inventory.

Stockpile goals were increased, but deliveries to the stockpile were running behind schedule. To increase the supply of metal for stockpiling, idle facilities at Badin, N. C., and Massena, N. Y., were reactivated by a Government purchase contract, which provided subsidies to defray power costs above 5 mills per kilowatt-hour. This contract will provide 79,000 tons a year for stockpiling.

PRICES

The base price of primary aluminum ingot, 99 plus percent pure, was 19 cents per pound f. o. b. shipping point at the close of 1950. This was a 12-percent increase over the 17-cent price established October 11, 1948, and continued until May 1950. In May the price

[4] Chase, Herbert, Plaster Molds for Intricate Aluminum Torque Converter Parts: Iron Age, vol. 161, No. 7, Feb. 12, 1948, pp. 60–68.
[5] Patton, W. G., Diecasting Auto Inner Door Frames in Aluminum: Iron Age, vol. 164, No. 3, July 21, 1949, pp. 90–93.
[6] Light Metals Age, Aluminum Die-Cast Door Frame: Vol. 7, Nos. 5 and 6, August 1949, pp. 16–17.

was raised to 17½ cents per pound. Effective September 25, Alcoa raised the price of primary ingot to 19 cents per pound. Reynolds and Kaiser followed with comparable increases on September 29 and October 3, respectively.

During 1950 other metals increased by the following percentages: Finished steel, 5 percent; electrolytic copper, 33 percent; lead, 42 percent, and Prime Western zinc, 79 percent. The 12-percent rise in aluminum in 1950 was partly compensatory for the lesser rise in aluminum, compared with other metals, in the earlier postwar period. The 1950 average price of aluminum was only 16 percent higher than the average for 1941–45, compared with 65 percent for steel, 82 percent for electrolytic copper, 71 percent for zinc, and 109 percent for lead.

TABLE 3.—Prices of aluminum ingot and other major metals, 1941–50 [1]

Year	Aluminum, primary ingot (cents per pound)	Copper, electrolytic, New York (cents per pound)	Composite finished steel (cents per pound)	Lead, New York (cents per pound)	Zinc, Prime Western, St. Louis (cents per pound)
1941	16.50	11.87	2.65	5.79	7.48
1942	15.00	11.87	2.65	6.48	8.25
1943	15.00	11.87	2.65	6.50	8.25
1944	15.00	11.87	2.65	6.50	8.25
1945	15.00	11.87	2.73	6.50	8.25
1946	15.00	13.92	3.00	8.11	8.73
1947	15.00	21.15	3.42	14.67	10.50
1948	15.74	22.20	3.91	18.04	13.58
1949	17.00	19.36	4.21	15.36	12.15
1950:					
First quarter	17.00	18.37	4.38	11.65	9.83
Second quarter	17.23	20.25	4.38	11.39	12.49
Third quarter	17.55	22.83	4.38	13.46	15.70
Fourth quarter	18.99	24.37	4.45	16.68	17.50
Average	17.69	21.46	4.40	13.30	13.88

[1] Source: Metal Statistics, 1951 (American Metal Market).

The 19-cent-per-pound price applied only to domestic primary ingot. Since imported and secondary ingot comprises 40 percent of the total supply, it is necessary also to consider the prices of these materials, whose prices in 1950 varied widely from time to time both in actual amounts and in relation to the price of primary ingot. Canada supplied 88 percent of total imports in 1950, and Canadian export prices followed current United States prices. Prices at the point of shipment of ingot imported from 15 other countries rose from an average of 11.3 cents per pound in February 1950 to 21.1 cents per pound in December.

The average price of eight types of secondary alloy ingot in January 1950 was 17.2 cents per pound, just above the current primary ingot price. These prices prevailed until May with little change. In June the increasing shortage of ingot started a rapid rise of prices that continued through the end of the year. In December the average price of the same eight types of secondary ingot reached 31.4 cents per pound, 183 percent of the January average and 165 percent of the December price of primary ingot.

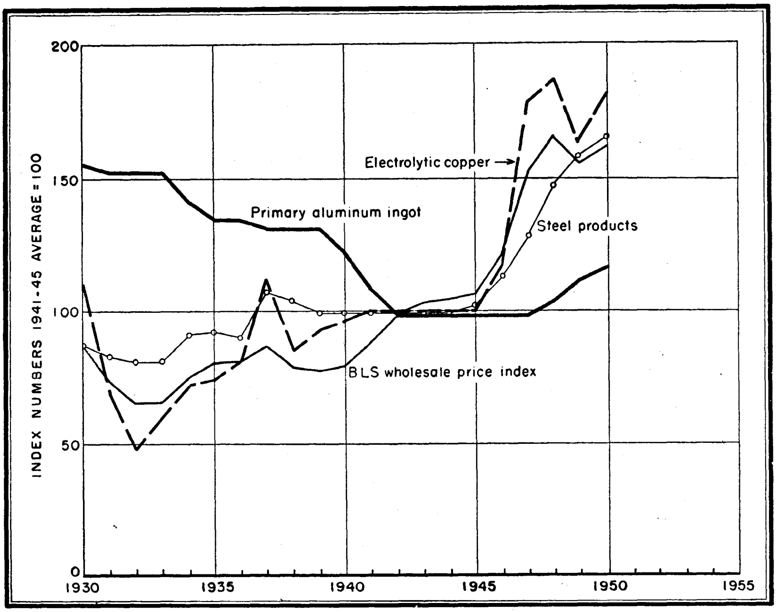

FIGURE 4.—Trends in price of aluminum ingot, electrolytic copper, and finished steel, compared with Bureau of Labor Statistics general wholesale price index, 1930–50. Index numbers computed for aluminum ingot, electrolytic copper, and finished steel from prices reported by the American Metal Market. Bureau of Labor Statistics index transposed from 1926 to 1941–45 base.

The weighted average price of domestic primary ingot, imported ingot and scrap, and domestic secondary ingot rose from 16.7 cents per pound in January 1950 to 21.4 cents per pound in December.

FOREIGN TRADE[7]

Foreign trade in aluminum, as indicated by total values of exports and imports, increased approximately 30 percent in 1950. Imports increased 86 percent; exports decreased 33 percent. The largest import items were ingot and scrap. Smaller quantities were imported as semifabricated material, such as plate, sheet, bars, etc. The largest export item was semifabricated material; some metal was exported as ingot and scrap. Net imports of nonfabricated metal (pig, ingot, and ingot equivalent of scrap) totaled 237,219 short tons—the largest tonnage since 1945, when excess Canadian ingot, which had been produced during World War II, was transferred to the United States. Very little scrap was imported before 1944, but in past years the volume of scrap has been steadily increasing. The largest amount was imported in 1948, coming mostly from a cleanup of war debris in Europe. The 1950 net import of 67,159 tons was only slightly smaller than in 1948.

[7] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 4.—Aluminum imported for consumption in the United States, 1948–50, by classes

[U. S. Department of Commerce]

Class	1948 Short tons	1948 Value	1949 Short tons	1949 Value	1950 Short tons	1950 Value
Crude and semicrude:						
Metal and alloys, crude	83,164	$21,332,336	77,342	$21,569,460	176,778	$48,366,733
Scrap	71,732	17,460,867	40,120	10,542,685	67,959	14,149,860
Plates, sheets, bars, etc	5,985	3,005,929	7,864	[1] 3,969,939	10,955	5,016,561
Total	160,881	41,799,132	125,326	[1] 36,082,084	255,692	67,533,154
Manufactures:						
Bronze powder and powdered foil	(2)	550	7	12,127	30	30,791
Foil less than 0.006 inch thick	18	29,049	197	188,308	297	335,088
Folding rules	(3)	5				
Leaf (5½ by 5½ inches)	(4)	74,485	(4)	29,527	(4)	38,514
Powder in leaf (5½ by 5½ inches)	(5)	114				
Table, kitchen, hospital utensils, etc.	87	157,156	93	177,006	163	256,523
Other manufactures	(6)	143,028	(6)	316,044	(6)	371,285
Total	(6)	404,387	(6)	723,012	(6)	1,032,201
Grand total	(6)	42,203,519	(6)	[1] 36,805,096	(6)	68,565,355

[1] Revised figure.
[2] Less than 0.5 ton.
[3] Number: 1948, 1; equivalent weight not recorded.
[4] Leaves: 1948, 14,784,188; 1949, 5,585,064; 1950, 10,389,134; equivalent weight not recorded.
[5] Leaves: 30,000; equivalent weight not recorded.
[6] Quantity not recorded.

In 1950 Canada continued to be the leading exporter of aluminum to the United States, accounting for 88 percent of total imports; 7 percent of United States imports were received from Europe and 4 percent from Asia. The largest imports of scrap to the United Sates were

TABLE 5.—Aluminum exported from the United States, 1948–50, by classes

[U. S. Department of Commerce]

Class	1948 Short tons	1948 Value	1949 Short tons	1949 Value	1950 Short tons	1950 Value
Crude and semicrude:						
Ingots, slabs, and crude	1,239	$424,676	8,018	$3,169,680	662	$259,408
Scrap	438	77,777	397	51,588	800	93,317
Plates, sheets, bars, etc	47,869	28,534,927	28,764	18,233,412	19,822	10,676,040
Total	49,546	29,037,380	37,179	21,454,680	21,284	11,028,765
Manufactures:						
Foil and leaf	1,976	1,566,315	1,462	1,205,492	832	720,885
Mill shapes	3,373	3,458,427	2,179	2,507,381	1,952	2,316,685
Powders and pastes (aluminum and aluminum bronze) (aluminum content)	474	444,967	366	380,439	251	246,505
Table, kitchen, and hospital utensils	1,376	2,432,637	925	1,673,619	678	1,319,548
Other manufactures	(1)	6,280,214	(1)	5,703,042	(1)	6,520,597
Total	(1)	14,182,560	(1)	11,469,973	(1)	11,124,220
Grand total	(1)	43,219,940	(1)	32,924,653	(1)	22,152,985

[1] Quantity not recorded.

from Europe, the total being 46,000 tons. Net imports of ingot in 1950 were 254 percent of the 1949 total, while net imports of scrap were 169 percent of 1949. Imports were stimulated by rising prices, and the import pattern shows that substantial tonnages of ingot and scrap may be expected from a number of countries whenever the price relationship is advantageous.

The import duty on aluminum in 1950 was as follows: Crude (ingot), 2 cents per pound; mill products (semifabricated), 3 cents per pound; scrap, 1.5 cents per pound until October 1, when all duty on scrap was lifted.

TECHNOLOGY

The method of manufacturing aluminum has remained basically the same in recent years, and the new capacity planned in the expansion program was designed to use established processes. United States production is obtained from bauxite, from which alumina is extracted by the Bayer process. The alumina is then reduced to metal in electrolytic cells.

During 1950 there was renewed interest in many of the processes for producing aluminum from low-grade materials such as clay, anorthosite, and aluminous rocks that had been investigated during the last war. At the close of the year no provision had been made for large-scale testing of these processes.

The location of reduction facilities for producing aluminum has been based, since the early days of the industry, on the availability of low-cost electric power. At the beginning of 1950, 8 of the 10 operating plants were at sites where low-cost hydroelectric power was available. Five of these plants, representing about half of the reduction capacity, were in the Pacific Northwest, distant from raw materials and the major markets, inasmuch as the requisite low-cost power has not been available in the more highly industrialized regions of the United States.

The development of gas and Diesel generator units, which generate direct-current power for use in electrolytic cells without conversion or transmission losses, as well as steam generators comparable in size with the largest hydroelectric generators has recently opened new areas for reduction facilities. One such area is the Gulf coast, which offers a convenient site because of availability of Caribbean and South American bauxite, as well as low-cost energy from southwestern gas and oil, and at the same time increases the defense security of the industry by increasing its dispersion. One new reduction plant has been constructed in this area, at Point Comfort, Tex., and two additional plants, at Corpus Christi, Tex., and Chalmette, La., were planned.

The new Alcoa plant at Point Comfort is entirely dependent on thermal power, which is supplied by natural gas from Texas gas fields. The gas engines that turn the generators were designed and built by the Nordburg Manufacturing Co. of Milwaukee and are unique in many respects. The engines are of the radial type, with 11 horizontal cylinders, 14-inch bore and 16-inch stroke, firing in rotation. These cylinders drive a master gear, which imparts rotation to the main shaft through a gear train. Each engine is directly coupled to a generator which produces 1,000 kilowatts of direct-current power at 667 volts. The power is fed into an aluminum bus bar leading directly to the pot rooms. One hundred and twenty of these engines supply the total electrical energy required for the 57,000-ton-annual-capacity plant.

The entire plant makes good use of its own product. The buildings are covered with aluminum roofing and siding; stacks, heat exchangers, transmission facilities, and the radial engines are constructed largely of aluminum. Other improvements in use at the Point Comfort plant and/or planned for the other new facilities are Soderburg self-baking electrodes and facilities for recovering dust and fume from the electrolytic cells, thus permitting recovery, in turn, of valuable alumina and electrolyte.[8]

WORLD REVIEW

World production of primary aluminum ingot was 1,628,000 short tons in 1950 (partly estimated), a 13-percent increase over 1949 (revised data). The United States and Canada continued to dominate the production field with a combined production of 1.1 million short tons of primary ingot, over 68 percent of the world total. The output of aluminum in the U. S. S. R. and satellite countries is not definitely known, but estimates indicate that they produce approximately 12 percent of the world total. Increased production in this area is believed to be about the same as that for the rest of the world. Almost all of the aluminum-producing countries increased their output in 1950. The largest percentage increase (79 percent) was achieved by Spain but represented less than 1,000 metric tons. Of the countries producing over 10,000 metric tons per year, the largest increase was achieved by Italy (45 percent or 11,400 metric tons), closely followed by Norway, with 33 percent or 11,600 metric tons. The largest tonnage gains were made by the two largest producers, the United States and Canada, with a total increase over 1949 production of 127,300 metric tons. Unused capacity awaiting additional power or better economic conditions was available in Austria, France, Western Germany, India, Italy, and Formosa. Construction of alumina and aluminum plants and other power facilities were underway in Norway, Brazil, Sweden, Yugoslavia, New Zealand, and Tasmania, as well as in the United States and Canada.

Australia.—During 1950 work was begun on construction of an aluminum-reduction plant at Bell Bay, Northern Tasmania, the first such facilities in Australia. The plant was reported to have been purchased in Norway. An initial production of 13,000 metric tons per year was planned, with subsequent expansion to 25,000 tons. Additional reduction facilities for Australia were in the planning stage. Malayan bauxite was to be treated.

Austria.—Difficulties associated with the power supply limited primary production in Austria in 1950. With a rated capacity of over 40,000 metric tons per year, production was only 18,000 tons. There

[8] Metal Progress, Alcoa's New Plant at Point Comfort, Tex.: Vol. 58, No. 1, July 1950, pp. 56–59.

TABLE 6.—World production of aluminum, by countries, 1944–50, in metric tons

[Compiled by Pauline Roberts]

	1944	1945	1946	1947	1948	1949	1950
Austria	40,097	5,250	1,032	4,544	13,319	14,835	17,988
Brazil	----------	480	----------	----------	----------	----------	----------
Canada	419,176	195,691	175,449	271,302	333,007	335,172	358,000
China:							
Taiwan (Formosa)	[1] 9,201	592	----------	----------	2,509	[2] 1,580	(3)
Manchuria	[1] 7,618	[2] 1,500	----------	----------	----------	----------	(3)
France	26,154	37,225	47,952	53,395	64,785	54,140	[2] 61,000
Germany:							
Federal Republic	191,000	[2] 20,000	----------	----------	7,306	28,848	26,951
Soviet Zone			(3)	(3)	(3)	(3)	(3)
Hungary	[4] 13,190	2,351	1,970	5,203	[2] 9,400	[2] 14,000	(3)
India	1,751	2,290	3,296	3,267	3,421	3,547	3,650
Italy	16,796	4,347	11,040	25,065	33,083	25,647	37,070
Japan	109,464	16,450	3,190	2,700	6,965	21,222	24,764
Korea	12,943	[5] 1,243	1,600	1,300	[2] 1,300	(3)	(3)
Norway	20,035	4,608	16,692	21,725	31,041	35,047	46,622
Spain	206	592	1,007	1,000	523	1,212	2,167
Sweden (includes alloys)	3,723	3,236	3,566	2,892	3,279	3,929	4,000
Switzerland	9,686	5,029	13,083	18,458	18,960	21,000	21,000
U. S. S. R.[2]	71,000	86,310	105,000	120,000	140,000	165,000	[2] 190,000
United Kingdom	36,038	32,432	32,067	29,384	30,510	30,832	29,941
United States	704,376	449,109	371,608	518,680	565,587	547,449	651,920
Yugoslavia	[2] 1,000	----------	560	1,330	1,890	2,400	[2] 2,500
Total (estimate)	1,693,000	870,000	790,000	1,080,000	1,265,000	1,305,000	1,480,000

[1] Fiscal year ended Mar. 31 of year following that stated.
[2] Estimated.
[3] Data not available; estimate by authors of chapter included in total.
[4] January to June, inclusive.
[5] April to June, inclusive.

was not only a shortage of electrical power but also of transformer and distribution equipment.

Brazil.—In 1950 plans were underway for constructing an aluminum plant in São Paulo, near São Paulo City, with a production capacity of 7,800 metric tons per year to supply metal for the numerous aluminumware plants in the State. Bauxite was to be mined at Pocos de Caldas, about 150 miles from the plant.

Canada.—Canada, a country with relatively small domestic requirements, ranked among the top three world aluminum producers. The availability of low-cost power near ocean ports gives this country a cost advantage over other producers. During 1947–50 only 16 percent of the aluminum produced in Canada was sold in domestic market, and of this a part was later exported as fabricated or manufactured products. In 1950 shipments to the United States from Canada were 162,600 short tons, about 41 percent of Canadian production for the year. The United Kingdom is also a large purchaser of Canadian metal.

The capacity of existing plants was reported by Aluminium Ltd., the only primary producer, to be 470,000 metric tons per year. Production in 1950 was about 360,000 metric tons. The annual report of the company for 1950 states that "from the beginning of the year under review, the production of primary aluminum has been maintained at the maximum capacity determined by the availability of hydroelectric power." The Quebec Legislature passed a bill in 1950 which empowers the Provincial Government to enter into an agreement with Alcan for development of new power projects on the Perebonka

River, in the Saguenay district, near present facilities. An initial capacity of 50–60,000 hp. was proposed for installation by May 1952 and 200,000 hp. by August 1952.

The possibility of establishing a new aluminum center in British Columbia was being investigated. Plans called for this to be a 600-million-dollar installation, with an annual capacity of half a million tons of ingot.

China.—The production of aluminum in China was in previous years obtained from two plants in Manchuria and one in Taiwan (Formosa). No information on Manchurian operations in 1950 is available. The plant in Taiwan was closed down during the latter part of the year because of a lack of raw materials.

France.—France produced an estimated 61,000 metric tons of primary aluminum in 1950 from a rated capacity of 95,000 tons. A limiting factor was the available electrical energy, which is obtained from watersheds in the Alps and Pyrenees. The French plants can obtain capacity production only in the summer, when maximum hydroelectric power is available; thermal generators are necessary to increase production from existing installations.

Germany.[9]—The Federal Republic (Allied Zone) of Germany produced 27,000 metric tons of aluminum in 1950. An aluminum capacity of 85,000 tons per year was authorized by the Allied powers in 1949, but the way in which this capacity was to be distributed among the five existing plants had not been determined. Here, too, shortage of electrical power limited 1950 production.

The two plants in the Soviet Zone of Germany were reported to have been largely dismantled and shipped to the U. S. S. R. A small potline remaining at Bitterfeld was reported to be producing a small amount of primary aluminum for upgrading secondary metal. Secondary smelters were active.

Hungary.—Information regarding aluminum production in Hungary in 1950 is sketchy. Very little hydroelectric power was available, and lack of power facilities was a retarding factor in this country, which has large, high-grade bauxite deposits. The domestic chemical industry did not appear to be able to supply the necessary soda ash and cryolite for any extensive expansion. A new aluminum works was being erected at Almasfuzito, but its degree of completion was not known.

India.—India, with a reported capacity of 6,000 metric tons per year, produced 3,650 tons in 1950 and consumed approximately 12,000. Production was hampered by lack of power, slow deliveries of petroleum coke, and inadequate fuel for transportation of bauxite. The Indian Government announced a plan to subsidize output for 3 years to encourage production.

Italy.—Aluminum production in Italy increased 11,423 metric tons over 1949 for a 1950 total of 37,070 metric tons. This increase was due largely to a better electrical supply. A new aluminum plant, utilizing Gargano Peninsula bauxite, was planned for Bari.

Japan.—Japan produced 25,000 metric tons of primary aluminum in 1950, an increase of 17 percent over 1949. Japan's aluminum

---

[9] See Pearson, B. M., A Survey of the Aluminum Industry in Postwar Germany: Light Metal Age, June 1950, pp. 15–16.

production capacity was reported to be 114,000 metric tons per year in 1946, but output has been retarded by political and economic factors. Bauxite was obtained from Indonesia. In 1949 economic conditions limited the domestic market for aluminum products, and the world market was too low to permit substantial exports except for manufactured articles in relatively small amounts. Beginning in the middle of 1950, the increased world demand resulting from a shortage in the United States made export prices attractive, and exports of ingot, scrap, and fabricated products exceeded the total production for the year. About 40 percent of Japanese exports during 1950 came to the United States; the remainder was distributed widely, going principally to South America, Canada, and Asia.

New Zealand.—The New Zealand Government was reported to have plans for setting up a plant in the Antipodes with an annual capacity of 50,000 metric tons per year.

Norway.—The domestic market for Norwegian aluminum was small, probably not more than 5,000 metric tons per year, but projected plans provided for increasing the domestic capacity to 95,000 tons per year by 1952 or 1953. Capacity at the beginning of 1950 was about 50,000 tons. In 1950 the Government started construction of a new plant at Sunndalsoyia, near the Aura power station, and completed its first expansion of the German-built plant at Ardal. Approximately 40,000 tons of added Government capacity was under construction. The Stangfjord Electrochemical Works at Eydehavn was installing a plant for producing 1,500 tons per year of super-purity aluminum (99.996 percent Al). Only one of the seven Norwegian plants produced its own alumina; the remainder was imported.

Spain.—The large increase (79 percent) in Spain's aluminum output was achieved by opening new Government-owned production facilities at Valladolid. A part of this plant began operation in November 1949. When completed, this new plant was to have a reported capacity of 5,000 metric tons per year.

Sweden.—Sweden produced 4,000 metric tons of aluminum and aluminum alloys in 1950, which was sufficient to supply only one-quarter of its domestic requirements. To boost production, the Government guaranteed a subsidy of 30 kronen per ton up to a total of 240,000 kronen spread over a 20-year period. It was planned to increase the production of the Kubikenbork works to 8,000 tons per year.

Switzerland.—Aluminum production in Switzerland in 1950 was about the same as for 1949; no plans for expansion were reported. Swiss aluminum interests operated extensively outside of the country and owned stock in aluminum facilities in Italy, France, Great Britain, Spain, Hungary, Czechoslovakia, Austria, and Germany.

United Kingdom.—The 30,000 metric tons of aluminum produced in the United Kingdom in 1950 supplied about one-eighth of its requirements, the balance of its supply being obtained largely from Canada. The high industrial concentration and lack of additional economic power in the British Isles precluded any large home expansion. A commission was established to investigate development of an aluminum industry on the African Gold Coast, using power from the Volta River and Gold Coast bauxite.

U. S. S. R.[10]—The figure given for aluminum production in the U. S. S. R. for 1950 is an estimate, as no official information is obtainable. Published production estimates from various sources varied from 50,000 to 500,000 metric tons. The western plants of Volkhov near Leningrad and Zaporzhyte on the Dneiper, which were destroyed in World War II, had been rebuilt and were in operation. The main center of production was the Ural Mountains; existing plants were enlarged and new plants added. The large German installations, previously at Lauta and Bitterfield, had been dismantled and moved to the U. S. S. R. and were presumably contributing to U. S. S. R. production. There were also indications of production or construction of facilities in Siberia and at Yerevan in Armenia.

Venezuela.—The Reynolds Metal Co. considered construction of aluminum facilities near the Orinoco River in Venezuela. This location would offer the advantage of cheap ore transportation from the Guianas by coastal shipping, and hydroelectric power would be developed on the Orinoco River.

Yugoslavia.—In 1950 Yugoslavia had one small aluminum plant in operation, with an estimated production of 2,500 metric tons. New aluminum facilities were under construction at Strnisci near Ptuj, but the economic and political situation has retarded their completion. These facilities were designed and partly constructed by the Germans during World War II and were further completed by the U. S. S. R. They were estimated as being 70 percent complete in 1950 and were to have a capacity of 30,000 tons of aluminum per year when finally constructed. Power was to be supplied from hydroelectric facilities being constructed on the Drava River near Maribor.

---

[10] *See* Metal Bulletin, A Survey of the Soviet Union's Nonferrous Metals Industries: No. 3490, May 9, 1950, pp. 11–22.

Antimony

By Abbott Renick and E. Virginia Wright

GENERAL SUMMARY

THE WORLD production of 50,000 metric tons of antimony in 1950 was 13,000 tons higher than in 1949 and exceeded the 1941–45 average (47,000 tons) by 6 percent.

Increases in the domestic primary antimony industry were as follows: Mine output, 53 percent; smelter production of metal, oxide, and sulfide, 17 percent; consumption of primary antimony, 34 percent; and industry stocks, 23 percent. Imports of ore, metal, and needle antimony increased 53 percent. Secondary production was 21 percent above the 1949 output. Quoted prices for antimony, RMM Brand, in cases, New York City, varied between a low of 26.28 and a high of 33.78 cents per pound. Average price for this metal during 1950, according to the American Metal Market, was 29.41 cents per pound.

The "new supply" of primary antimony during 1950, in terms of recoverable metal, was 19,721 short tons. A breakdown of this supply shows that domestic antimony ores contributed 2,297 tons;[1] domestic and foreign lead-silver ores, 2,850; and imports 14,574 tons. The antimony imported arrived as follows: Ore and concentrates 8,966 tons; metal, 4,632; needle, 13; and antimony oxide, 963. The supply from secondary sources was 21,862 short tons.

TABLE 1.—Salient statistics for antimony in the United States, 1941–45 (average) and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Production:						
Primary (antimony content):						
Mine........short tons..	3,276	2,505	5,316	6,489	1,636	2,497
Smelter, from domestic and foreign ores.....do....	(1)	12,422	13,782	14,308	8,099	9,471
Secondary (antimony content).........do....	17,669	19,115	22,984	21,592	18,061	21,862
Imports for consumption:						
Antimony in ore.........do....	21,762	5,903	9,257	13,464	7,473	9,746
Needle.........do....	232	....	17	533	81	19
Metal.........do....	1,890	2,593	5,879	3,201	1,853	4,632
Exports of antimony ore and metal.........do....	(1)	462	808	327	485	154
Consumption of primary antimony [2].........do....	(1)	17,515	16,647	15,455	11,530	15,494
Average price of antimony at New York:						
Chinese (nominal).........cents per pound..	16.50	16.50	(1)	(1)	(1)	(1)
American [3].........do....	15.42	17.31	33.45	36.67	38.73	29.41
World production [4] **(contained)**.........metric tons..	47,000	26,000	38,000	45,000	37,000	50,000

[1] Data not available.
[2] Antimony recovered chiefly as antimonial lead at primary lead refineries from domestic and foreign silver and lead ores not included.
[3] American Metal Market.
[4] Exclusive of U.S.S.R. Data differ from those given for world production in Antimony chapters for previous years, where they were in terms of recoverable metal content, computed at 92 percent of reported gross content.

[1] In terms of recoverable metal content, calculated at 92 percent of mine and mill production. Smelter production from domestic ores was 1,200 tons in 1950.

Estimated consumption of antimony in the United States during 1950 was 40,206 tons, comprising 18,344 tons of primary and 21,862 tons of secondary.

Primary antimony consumed as such in the manufacture of finished products totaled 15,494 tons. This figure includes losses in certain intermediate smelting and refining operations. In addition to the 15,494 tons, 2,850 tons of primary antimony were recovered, chiefly

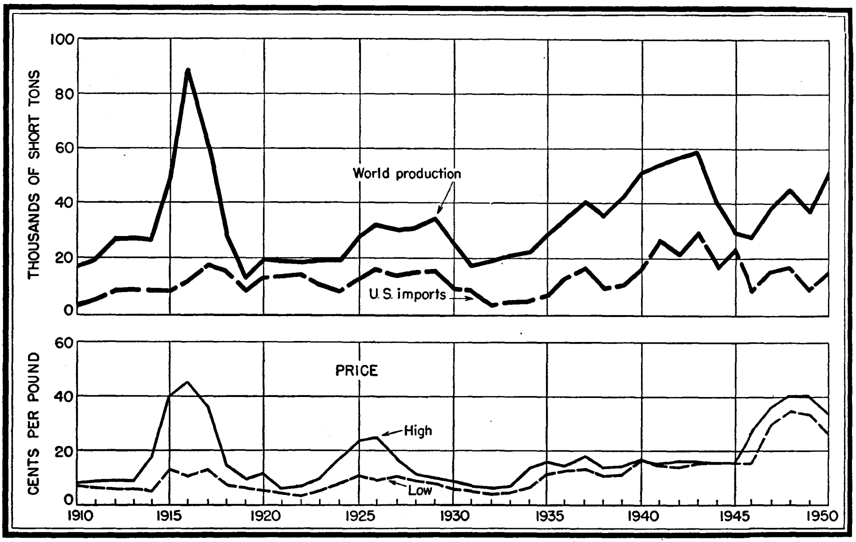

FIGURE 1.—Trends in world production, United States imports and New York price of antimony, 1910–50.

as antimonial lead, from domestic and foreign silver and lead ores. Secondary production and shipments of antimony, recovered chiefly in lead-base alloys at secondary plants, including antimony from scrap at primary lead refineries, amounted to 21,862 tons.

As of December 11, 1950, an increase from 1 cent to 2 cents a pound in the import duty on metal and regulus became effective.

DOMESTIC PRODUCTION

MINE PRODUCTION

During 1950 shipments of antimony ores and concentrates totaled 6,888 short tons containing 2,497 tons of antimony, of which 2,297 were estimated as recoverable. In addition, 2,850 tons of antimony were recovered from silver and lead ores at primary lead refineries. Compared with 1949, the 1950 output from antimony ores and concentrates increased 53 percent and from silver and lead ores 77 percent.

Alaska.—Earl Pilgrim operated the Stampede mine in the Kantishna District.

California.—Cordero Mining Co., in the Lone Tree district, San Benito County, is actively engaged in underground development. This property was diamond-drilled by the Bureau of Mines during the spring of 1950 as part of a program for ascertaining the Nation's potential supply of critical metals and minerals.

Idaho.—Bradley Mining Co., the principal producer of antimony in the United States, produced 6,723 tons of concentrate containing 2,424 tons of antimony. The new antimony smelter at this property operated intermittently during 1950, while numerous metallurgical difficulties were being worked out. Improvements and plant additions were made which were expected to raise 1951 output (largely in the form of antimony oxide) to over 3,500 tons.

Hermada Mining Co. operated its mine in Elmore County; the Coeur d'Alene Mining Corp. operated the Mineral Point mine at Wallace; and the Sunshine Mining Co., Shoshone County, recovered considerable antimony from silver-lead ores.

Nevada.—Tony Romano operated the Big Creek mine and Phil Cox operated the Antimony King mine at Austin and John B. Wardlaw operated the Last Chance mine at Tonopah.

TABLE 2.—Antimony-bearing ores and concentrates produced in the United States,[1] 1941–45 (average), and 1946–50, in short tons

Year	Gross weight	Antimony content		Year	Gross weight	Antimony content	
		Quantity	Average percent			Quantity	Average percent
1941–45 (average)	11,138	3,276	29.4	1948	16,239	6,489	40.0
1946	13,962	2,505	17.9	1949	5,260	1,636	31.1
1947	20,020	5,316	26.6	1950	6,888	2,497	36.3

[1] Includes Alaska.

SMELTER PRODUCTION

Primary.—Antimony smelters in the United States produced metal, oxide, and sulfide containing a total of 9,471 short tons of antimony from domestic and foreign ores in 1950, an increase of 17 percent over 1949. The Bureau of Mines is not at liberty to publish precise separate data on these three intermediate primary products. However, approximately 65 percent of the output in 1950 (about 60 percent in 1949) was in the form of oxide.

Antimonial lead produced as a byproduct by domestic primary lead refineries from ores and scrap totaled 61,912 tons containing 4,504 tons of antimony in 1950, an increase of 50 percent from the 1949 output of 41,402 tons containing 3,385 tons of antimony. A detailed discussion of antimonial lead production is contained in the Lead chapter of this volume.

Secondary.—Antimony produced at secondary metal plants, including 1,654 tons recovered from scrap at primary lead refineries, was 21,862 short tons, an increase of 21 percent over 1949. A detailed review is contained in the Secondary Metals—Nonferrous chapter of this volume.

TABLE 3.—Antimony metal, alloys, and compounds produced in the United States, 1941–45 (average) and 1946–50, in short tons

Year	Primary metal, oxide, and sulfide (antimony content)	Antimonial lead produced at primary lead refineries						Total secondary antimony (content of alloy [3])
		Gross weight	Antimony content					
			From domestic ores [1]	From foreign ores [2]	From scrap	Total		
						Quantity	Percent	
1941–45 (average)	(4)	53,982	2,068	564	1,213	3,845	7.1	17,669
1946	12,422	50,480	1,231	226	1,828	3,285	6.5	19,115
1947	13,782	86,075	1,460	571	2,902	4,933	5.7	22,984
1948	14,308	100,764	2,190	1,031	2,539	5,760	5.7	21,592
1949	8,099	41,402	1,214	396	1,775	3,385	8.2	18,061
1950	9,471	61,912	2,253	597	1,654	4,504	7.3	21,862

[1] Includes primary residues and small quantity of antimony ore.
[2] Includes foreign base bullion and small quantity of foreign antimony ore.
[3] Includes antimony content of antimonial lead produced at primary lead refineries from scrap.
[4] Data not available.

CONSUMPTION AND USES

During 1950 the consumption of primary antimony increased 34 percent. Consumption in metallic products increased 40 percent and in nonmetallic products 27 percent. The use of secondary material, chiefly in metallic products, remained on the same level as during 1949.

TABLE 4.—Industrial consumption of primary antimony, 1945–50, in short tons [1]

Product	1945	1946	1947	1948	1949	1950 [2]
Metal products:						
Ammunition	107	30	24	21	6	9
Antimonial lead [3]	5,920	4,827	} 6,172	6,024	4,737	4,912
Battery metal	1,273	1,084				
Bearing metal and bearings	2,825	2,886	2,056	1,803	873	3,256
Cable covering	275	79	61	62	172	72
Castings	267	233	129	81	49	126
Collapsible tubes and foil	203	121	77	31	14	23
Sheet and pipe	368	218	225	195	306	300
Solder	125	281	132	145	155	162
Type metal	1,243	1,903	1,216	1,019	587	766
Total metal products	12,606	11,662	10,092	9,381	6,899	9,626
Nonmetal products:						
Ammunition primers	66	15	16	6	9	9
Antimony trichloride	207	106	(4)	(4)	(4)	(4)
Flameproofed textiles	7,675	97	205	388	[5] 273	369
Frits and ceramic enamels	936	1,814	1,754	1,561	1,155	1,462
Glass and pottery	304	351	421	352	296	579
Matches	18	25	23	37	28	56
Paints and lacquers	3,062	1,662	1,324	1,288	874	267
Plastics	(4)	(4)	[6] 156	228	[5] 498	737
Rubber	(4)	(4)	39	41	55	103
Sodium antimonate	512	1,358	(4)	(4)	(4)	(4)
Other	375	425	2,617	2,173	1,443	2,286
Total nonmetal products	13,155	5,853	6,555	6,074	4,631	5,868
Grand total	25,761	17,515	16,647	15,455	11,530	15,494

[1] Data for 1945–48 compiled from monthly applications filed with the Office of Materials Distribution, U. S. Department of Commerce (formerly with War Production Board and Civilian Production Administration).
[2] Data for 1950 include certain intermediate smelting and refining losses, which have been deducted for earlier years.
[3] Includes miscellaneous metallic products.
[4] Included with "Other." Bureau of Mines not at liberty to publish separate figures.
[5] Revised figure.
[6] Consumption April through December 1947; January through March included with "Other."

STOCKS

At the close of 1950, industry stocks of antimony were 35 percent higher than the 6,073 tons reported at the end of 1949. Mine stocks at the beginning and end of 1950 were 195 tons and 626 tons respectively. Other industry stocks were 5,878 tons in 1949 and 7,563 tons on December 31, 1950.

TABLE 5.—Industry stocks of antimony in the United States at end of year, 1949–50, in short tons of contained antimony

Raw material	Dec. 31, 1949			Dec. 31, 1950		
	Mine	Other	Total	Mine	Other	Total
Ore and concentrates	195	2,268	2,463	626	3,493	4,119
Metallic antimony		1,587	1,587		1,888	1,888
Antimony oxide		1,915	1,915		1,989	1,989
Antimony sulfide (needle)		108	108		193	193
Total	195	5,878	6,073	626	7,563	8,189

PRICES

The price of antimony metal in bulk, f. o. b. Laredo, Tex., averaged 27.626 cents per pound; ranging from 24.50 to 32.00 cents per pound in 1950. The New York price was approximately 1.78 cents a pound higher than the Laredo quotation and averaged 29.406 cents a pound for 1950. The 1949 average New York price was 38.73 cents per pound.

According to E&MJ Metal and Mineral Markets, opening and changes in nominal quotations for antimony ore during 1950, per unit (20 pounds) of antimony contained were as follows:

	50–55 percent	*58–60 percent*	*60–65 percent*
Jan. 5, 1950	\$2.50–\$2.60	\$2.60–\$2.70	\$2.70–\$2.80
Jan. 26, 1950	2.40–2.50	2.60–2.70	2.70–2.80
June 8, 1950	1.80–1.90	2.00–2.10	2.20–2.30
Sept. 21, 1950	2.70–2.80	2.90–3.00	3.00–3.10
Nov. 2, 1950	3.85–3.95	3.95–4.10	4.50–5.00
Dec. 7, 1950	4.25–4.30	4.30–4.40	4.75–5.00

FOREIGN TRADE [2]

Imports.—General imports of antimony in ore and as metal increased 30 and 150 percent, respectively; antimony as needle decreased 77 percent. The over-all increase in imports was due chiefly to the increased consumer demands. Imports of ore and concentrates came principally from Bolivia, Mexico, Peru, and Chile. Imports of metal were chiefly from Mexico, Belgium–Luxembourg, and Yugoslavia.

Imports of antimony oxide totaled 1,160 tons, valued at \$428,386. The bulk of it came from the United Kingdom and Belgium. This is in sharp contrast to the 56 tons imported in 1949. Imports of salts and compounds totaled 10 tons, valued at \$3,106. These originated in the United Kingdom.

As of December 11, 1950, an increase from 1 cent to 2 cents a pound in the import duty on metal and regulus became effective.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 6.—Antimony imported for consumption in the United States, 1946–50 [1]

[U. S. Department of Commerce]

Year	Antimony ore			Antimony needle		Antimony metal		Type metal and antimonial lead [2] (short tons)
	Short tons (gross weight)	Antimony content		Short tons (gross weight)	Value	Short tons	Value	
		Short tons	Value					
1946	19,741	5,903	$1,323,903			2,593	$824,698	246
1947	28,471	9,257	2,672,249	17	$7,914	5,879	3,487,126	187
1948	41,610	13,464	4,312,431	533	314,809	3,201	2,022,676	1,569
1949	17,855	7,473	2,488,271	81	42,537	1,853	1,242,582	654
1950	22,307	9,746	1,850,162	19	8,895	4,632	2,204,091	1,927

[1] Does not include antimony contained in lead-silver ores.
[2] Estimated antimony content; for gross weight and value, see Lead chapter of this volume.

TABLE 7.—Antimony imported into the United States, 1946–50, by countries [1]

[U. S. Department of Commerce]

Country	Antimony ore			Antimony needle		Antimony metal	
	Short tons (gross weight)	Antimony content		Short tons (gross weight)	Value	Short tons	Value
		Short tons	Value				
1946	19,744	5,905	$1,324,117			2,593	$824,698
1947	[2] 28,482	[2] 9,421	[2] 2,673,325	17	$7,914	5,899	3,499,947
1948	41,610	13,464	4,312,431	533	314,809	3,317	2,096,573
1949							
Belgium-Luxembourg						384	254,033
Bolivia [3]	4,845	3,153	1,287,540				
Canada	164	49	13,265			11	6,578
Chile [3]	814	544	243,817				
China				81	42,537	[2] 297	[2] 191,498
Honduras	16	8	4,725				
Italy						44	28,550
Mexico	10,527	2,985	677,795			768	564,202
Netherlands						11	8,136
Peru [3]	1,478	727	258,129				
Portugal	11	7	3,000				
United Kingdom						78	40,365
Yugoslavia						472	264,272
Total	17,855	7,473	2,488,271	81	42,537	[2] 2,065	[2] 1,357,634
1950							
Australia	57	20	10,539				
Belgium-Luxembourg	110	50	13,200	6	2,354	936	407,275
Bolivia [3]	8,859	5,488	1,176,272				
Canada	748	258	33,748				
Chile [3]	1,510	877	168,190				
China				13	6,541	92	31,779
Czechoslovakia						44	20,724
France	100	55	9,047			277	118,515
French Morocco	88	79	18,143				
Germany						325	108,467
Japan	39	23	1,244			(4)	250
Mexico	11,504	3,127	440,173			1,478	825,108
Netherlands						138	55,671
Peru [3]	1,053	357	80,924				
Siam	27	16	6,219				
Spain						52	20,552
Sweden						55	22,326
Switzerland						11	6,403
United Kingdom						285	134,556
Yugoslavia						795	369,873
Total	24,095	10,350	1,957,699	19	8,895	4,488	2,121,499

[1] Data are general imports, that is, include antimony imported for immediate consumption, plus material entering the country under bond. Table does not include imported antimony contained in lead-silver ores.
[2] Revised figure.
[3] Imports shown from Chile probably were mined in Bolivia or Peru and shipped from a port in Chile.
[4] Less than 0.5 ton.

Exports.—Exports in 1950 (gross weight) of antimony ore were 6 tons valued at $865; metal and alloys, 148 tons valued at $86,496; and salts and compounds, 184 tons valued at $103,167. During 1949 exports (gross weight) included 35 short tons of antimony ore and concentrates valued at $10,984 and 450 tons of metal and alloys valued at $337,177. Reexports of ore in 1950 were 39 tons valued at $4,450, and of regulus or metal, needle, alloys, and scrap, 68 tons valued at $41,348.

TECHNOLOGY

Developments in the antimony industry were discussed in a review of published work, 1945–50.[3]

The antimony-smelting plant at Vajskova, Czechoslovakia, was described.[4]

Results of antimony-plating experiments were given in an article, Bright Deposits from Complex Citrate Baths by Electro Deposits.[5]

Several United States patents relative to antimony were issued during 1950.[6]

WORLD REVIEW

Algeria.—The Society of African Mines has instituted a vigorous development program at the Ain Kerma antimony deposits which will permit the recovery of substantial tonnages.[7]

Austria.—The Economic Cooperation Administration announced that a mill for concentrating antimony ore began operation in Carinthia during 1950. Construction of the mill was financed by the ECA. The annual capacity is 7,200 tons of ore.[8]

Japan.—Antimony is being produced by a new process at the Nakase smelting plant which was constructed late in 1948. The Nakase plant successfully treats domestic low-grade stibnite ore.[9]

Union of South Africa.—During the year, the Consolidated Murchison (Transvaal) Goldfields Development Co. made arrangements to increase its milling capacity to 14,000 tons of antimony ore monthly.[10]

Yugoslavia.—A new flotation mill at the Zaja mine, to be completed this year, will increase the production of antimony metal 15 percent.[11]

---

[3] Metal Industry, vol. 77, No. 24, December 15, 1950, p. 276.
[4] Mining Magazine (London), vol. 83, No. 4, October 1950, p. 217.
[5] Metal Industry, vol. 76, No. 14, April 7, 1950, p. 271.
[6] Moore, Edmond E., and Clemence, LeRoy W., The Use of Antimony Tartrate in Tropical Parasitic Diseases: U. S. Patent 2,509,201, May 30, 1950.
Downing, Frederick B., The Regeneration of Antimony Pentafluoride in the Manufacture of Fluorine Compounds: U. S. Patent 2,510,872, June 6, 1950.
Clemence, LeRoy W., and Leffler, Martin T., Oil-Soluble Antimonials: U. S. Patent 2,510,740, June 6, 1950.
Rust, John B., Production of Esters of Antimonious Acids and Particularly the Halo-esters Thereof: U. S. Patent 2,511,013, June 13, 1950.
Albert, Harry E., The Stabilization of Rubber With Antimony Salts: U. S. Patent 2,514,193, July 4, 1950.
[7] Mining World, vol. 12, No. 1, January 1950, p. 46.
[8] Engineering and Mining Journal, vol. 152, No. 4, April 1951, p. 169.
[9] Metal Bulletin (London), No. 3489, May 5, 1950, p. 10.
[10] Foreign Commerce Weekly, vol. 38, No. 13, March 27, 1950, p. 33.
[11] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 4, October 1950, p. 6.

TABLE 8.—World production of antimony (content of ore), by countries, 1944–50, in metric tons [1]

[Compiled by Pauline Roberts]

Country	1944	1945	1946	1947	1948	1949	1950
North America							
Canada [2]	879	757	291	522	141	72	295
Honduras	71	17	9	-------	6	9	([3])
Mexico [2]	10,930	8,754	6,572	6,925	7,380	5,753	5,868
United States	4,295	1,751	2,272	4,823	5,887	1,484	2,265
South America:							
Argentina	77	14	-------	-------	-------	-------	([3])
Bolivia (exports)	7,448	5,535	6,964	10,857	12,260	10,275	([3])
Peru	976	2,209	1,045	1,164	1,556	815	([3])
Europe:							
Austria	715	144	[4] 16	89	[5] 269	[5] 379	[5] 409
Czechoslovakia	1,941	1,212	2,300	4,500	4,100	([3])	[4] 2,000
France	126	166	220	201	275	294	[4] 330
Greece	-------	-------	-------	-------	-------	210	1,505
Hungary [4]	[6 7] 1,450	-------	-------	-------	-------	-------	-------
Italy	438	378	403	513	460	360	400
Portugal	36	3	3	25	41	([3])	([3])
Spain	139	117	104	91	144	171	[4 8] 400
Yugoslavia	([3])	946	1,891	1,361	1,980	2,789	([3])
Asia:							
British Borneo: Sarawak	-------	-------	-------	-------	4	1	2
Burma [4]	843	843	-------	46	121	70	([3])
China	[9] 203	-------	426	1,909	3,251	[4] 6,000	([3])
Indochina	28	-------	-------	-------	-------	-------	-------
Iran [10]	3	-------	-------	-------	-------	([3])	([3])
Japan	460	354	53	108	135	172	161
Thailand	[4] 59	[4] 44	-------	113	92	232	[4] 100
Turkey (Asia Minor)	60	40	80	140	600	450	1,600
Africa:							
Algeria	185	460	-------	130	746	1,338	1,450
French Morocco	181	284	260	470	520	660	670
Southern Rhodesia	126	33	16	83	9	41	21
Spanish Morocco	78	56	112	139	261	144	([11])
Union of South Africa	2,810	2,446	2,525	3,302	4,106	4,461	8,300
Oceania:							
Australia	494	187	539	173	188	177	222
New Zealand	-------	-------	-------	-------	5	3	([3])
Total (except U. S. S. R.)	36,000	27,000	26,000	38,000	45,000	37,000	50,000

[1] Approximate metal content of ore produced, exclusive of antimonial lead ores; U. S. S. R. produces antimony, but data on production are not available. (Data differ from those given in "Antimony" chapters for previous years where they were in terms of recoverable metal content computed at 92 percent of reported gross content.)
[2] Includes antimony content of antimonial lead.
[3] Data not available; estimate by author of chapter included in the total
[4] Estimate.
[5] Excludes Soviet Zone, data for which are not available.
[6] January to June, inclusive.
[7] Data represent Trianon Hungary after October 1944.
[8] Including Spanish Morocco.
[9] Data represent area designated as Free China during the period of Japanese occupation.
[10] Fiscal year ended Mar. 20 of year following that stated.
[11] Included in Spain.

Arsenic

By Arnold S. Kemp

GENERAL SUMMARY

THE production of 13,273 tons of white arsenic in 1950 slightly surpassed the 1949 output. Shipments exceeded production and reduced producers' stocks on hand at the end of 1950 to 2,479 tons, nearly 5,000 tons from the 1949 year end. Producers' stocks at the end of 1949 had been the highest since 1939, the first year for which the Bureau of Mines compiled such data.

Toward the end of the year shortages in chlorine, phenol, benzol, and other raw materials for the manufacture of the organic insecticides reduced the available supply and prospects for DDT, benzene hexachloride, 24D, 24–5T, chlordane, toxaphene, and parathion, which have been substituted for lead and calcium arsenate to a large extent. As a result, the progressive replacement of arsenical insecticides by organic insecticides was arrested. It was generally believed, however, that such shortages would be short-lived because increased plant facilities were scheduled to expand the supply of the basic organic materials early in 1951.

TABLE 1.—Salient statistics of the white arsenic industry in the United States, 1941–45 (average), and 1946–50, in short tons [1]

Year	Production	Sales	Imports	Exports [2]	Apparent consumption [3]	Producers' stocks	Prices per pound [4]
1941–45 (average)	30.561	31.505	13,174	1,431	43,248	2,580	$0.039
1946	10,211	12,039	13,821	[5] 1,000	24,860	471	.04 –.06
1947	18.755	18,188	13.940	[5] 1,000	31.128	1,038	.06
1948	18,639	14.965	9,336	----------	24.301	4,712	.06 –.06¼
1949	12,795	10,181	4,696	----------	14,877	7,326	.06 –.05½
1950	13,273	17,330	14,774	----------	32,104	2,479	.05½–.06½

[1] For data for earlier years (1910–45), see Arsenic chapter, Minerals Yearbook, 1949.
[2] Figures for 1943–45 from U. S. Department of Commerce; figures for other years reported by producers to Bureau of Mines.
[3] Producers' shipments, plus imports minus exports.
[4] Refined white arsenic, carlots, as quoted by Oil, Paint and Drug Reporter.
[5] Conjectural.

DOMESTIC PRODUCTION

Crude and refined white arsenic was produced in 1950 by the Anaconda Copper Mining Co., at Anaconda, Mont. (copper smelter); United States Smelting, Refining & Mining Co., at Midvale, Utah (lead smelter); and American Smelting & Refining Co., in plants at Tacoma, Wash. (copper smelter), and Murray, Utah (lead smelter). The Murray smelter had intermittent production in 1949 and 1950. Additional arsenic-removal facilities were being installed at the Tacoma plant and were scheduled for completion in 1951. Arsenic metal was produced by Anaconda Copper Mining Co. but only on a very small scale. Domestic white arsenic is produced principally as a byproduct in the smelting of copper and lead ores.

TABLE 2.—Production and shipments of white arsenic by United States producers, 1941–45 (average), and 1946–50

Year	Crude			Refined			Total		
	Production (short tons) [1]	Shipments		Production (short tons)	Shipments		Production (short tons)	Shipments	
		Short tons	Value [2]		Short tons	Value [2]		Short tons	Value [2]
1941–45 (average)	26,262	27,114	$1,141,445	4,299	4,392	$237,210	30,561	31,505	$1,378,654
1946	8,981	10,448	557,986	1,230	1,591	97,091	10,211	12,039	655,077
1947	17,636	17,119	1,424,316	1,119	1,069	109,440	18,755	18,188	1,533,756
1948	17,213	13,749	1,141,213	1,426	1,216	119,054	18,639	14,965	1,260,267
1949	12,289	9,597	713,984	506	584	50,527	12,795	10,181	764,511
1950	11,903	15,778	955,739	1,370	1,552	113,240	13,273	17,330	1,068,979

[1] Excludes crude consumed in making refined. Includes crude white arsenic equivalent of compounds made directly from ores, flue dust, and speiss as follows: 1941–45 (average), 203 tons; 1946, 180; 1947, 97; 1948, 88; 1949, 26; 1950, none.
[2] Partly estimated.

CONSUMPTION AND USES

The major portion of white arsenic produced is employed in the manufacture of calcium and lead arsenate insecticides. The apparent consumption of white arsenic was 32,104 short tons in 1950—more than double the 14,877 tons for 1949, which had been the lowest consumption year since 1922. In recent years the trend has been for organic insecticides to replace arsenic compounds. However, in the cooler fruit areas lead arsenate has regained preference over DDT. Cold weather in the 1950–51 crop year brought about a lower degree of infestation; however, increased plantings of cotton induced by higher cotton prices tended to offset any decrease in the use of calcium arsenate against the boll weevil.

Arsenic is also consumed in glass manufacture, sheep dip, poisoned baits, pharmaceuticals, and acid-resistant copper and antimonial lead alloys. Sodium arsenite is used as a weed killer. Wolman salts or tanalith (25 percent sodium arsenate) is used as a wood preservative.

TABLE 3.—Production of arsenical insecticides and consumption of arsenical wood preservatives, in the United States, 1941–45 (average), and 1946–50

Year	Production of insecticides (short tons) [1]		Consumption of wood preservatives (pounds) [2]
	Lead arsenate (acid and basic)	Calcium arsenate (100 percent $Ca_3(AsO_4)_2$)	Wolman salts (25 percent sodium arsenate)
1941–45 (average)	37,207	28,201	1,049,514
1946	28,334	17,696	1,669,889
1947	15,094	23,594	1,156,847
1948	12,316	13,618	1,286,302
1949	8,434	8,003	1,003,992
1950 [3]	19,750	23,750	1,197,617

[1] Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.
[2] Forest Service, U. S. Department of Agriculture.
[3] Preliminary figures.

STOCKS

Year-end producers' stocks of white arsenic for 1950 were 2,479 short tons, a sharp drop from 7,326 tons at the close of 1949. Since shipments of 17,330 tons in 1950 exceeded the annual production of 13,273 short tons, the balance required for consumption depleted the producers' inventories.

PRICES

The carlot quotation for refined white arsenic, which had been 5½ cents per pound since October 1, 1949, was increased to 6 cents on September 25, 1950, and further advanced to 6½ cents on December 5, 1950.

FOREIGN TRADE [1]

Imports.—White-arsenic imports totaled 14,774 short tons in 1950, compared with 4,696 tons in 1949, 9,336 tons in 1948, and an average of 13,633 tons in the years 1945–47. Of the tonnage imported in 1950, 86 percent came from Mexico, which has been the principal foreign source.

Imports of metallic arsenic totaled 137,533 pounds, with the United Kingdom supplying 49 percent, Netherlands 24 percent, and Sweden 21 percent.

Practically all of the 1950 imports of arsenic sulfide originated in Belgium-Luxembourg; arsenical sheep dips came exclusively from the United Kingdom.

TABLE 4.—White arsenic (As_2O_3 content) imported for consumption in the United States, 1946–50, by countries

[U. S. Department of Commerce]

Country	1946		1947		1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Belgium-Luxembourg					5	$961	30	$1,997	952	$43,544
Bolivia			11	$1,040						
Canada	275	$24,074	109	10,414	83	6,278	96	11.816	179	16,194
France			55	6,230					497	39,397
Germany									11	755
Italy					337	57,479				
Mexico	10,309	571,483	10,710	773,133	7,132	598,989	4,511	544,895	12,659	1,290,712
Peru	2,344	100,693	150	16,394	98	8,860				
Poland-Danzig			177	24,922			48	4,866	39	2,950
Portugal			55	8,207	28	4,409			50	3,204
Sweden	642	57,942	1,228	148,669	1,204	157,233	11	1,261	387	29,427
U. S. S. R.	251	18,833	1,445	156,459	449	49,320				
Total	13,821	773.025	13,940	1,145,468	9,336	883,529	4.696	564.835	14.774	1,426,183

Exports.—Producers of white arsenic reported no direct foreign sales in 1950. Exports of calcium arsenate decreased 5 percent from those of 1949, whereas exports of lead arsenate increased 21 percent. Colombia was the principal recipient of calcium arsenate, with Mexico, El Salvador, and Peru following in order. Their respective portions of the total were 56 percent, 23 percent, 8 percent, and 7 percent. Cuba

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

was the principal recipient of lead arsenate and with Brazil accounted for 90 percent of the total exported.

TABLE 5.—Arsenicals imported into and exported from the United States by classes, 1941–45 (average), and 1946–50, in pounds

[U. S. Department of Commerce]

Class	1941–45 (average)	1946	1947	1948	1949	1950
Imports for consumption:						
White arsenic (As_2O_3 content)	26,347,211	27,641,765	27,879,965	18,671,621	9,392,699	29,547,402
Metallic arsenic	17,766	92,064	18,928	36,587	45,369	137,533
Sulfide	447,517	88,184	44,092	88,608	44,092	147,055
Sheep dip	178,860	1,460	83,654	38,275	55,830	77,219
Lead arsenate		552	120,000			
Arsenic acid					200	2,000
Calcium arsenate						228,000
Sodium arsenate						110,152
Paris green						88,640
Exports:						
White arsenic	2,862,237	[1] 2,000,000	[1] 2,000,000	(1)	(1)	(1)
Calcium arsenate	4,426,920	6,877,347	4,967,249	4,569,346	4,047,406	3,857,107
Lead arsenate	4,769,091	2,795,205	3,103,863	2,037,645	860,530	1,040,100

[1] Beginning Jan. 1, 1946, not separately classified. Figures for 1946–47 are conjectural; none believed exported in 1948–50.

WORLD REVIEW

Belgium.—Various arsenic products are made by Société Générale Métallurgique de Hoboken at plants near Antwerp, Herenthals, and Reppel; by Société des Mines et Fonderies de Zinc de la Vieille-Montagne, Liège; and by Belgochimie S. A., Ghent.

Canada.—The Deloro Smelting & Refining Co., Ltd., Deloro, Ontario, produced about 245 metric tons of refined white arsenic in 1950, most of it from the treatment of silver-cobalt ores from northern Ontario. Experiments were conducted by the Obrien Gold Mine Co. and Beattie Consolidated Gold Mine Co. to improve recovery of crude arsenics.[2]

Finland.—Output of arsenic concentrates at the Ylojarvi mine in 1950 was 266 metric tons.

Mexico.—Byproduct white arsenic was recovered by Cia. Metalurgica Peñoles, S. A. (subsidiary of American Metal Co.) at its Torreon, Coahuila, lead smelter. The American Smelting & Refining Co. also produced white arsenic at its San Luis Potosi copper smelter.

Portugal.—Mina de Pintor refinery produced 801 metric tons of refined white arsenic in 1950. During the year exports amounted to 1,276 tons, the bulk of it going to the United Kingdom, which had a contract for the entire output in 1950.

Sweden.—The Boliden Mining Co., largest individual producer of white arsenic in the world, confirmed reduction of exports of arsenic because of the inroads of organic compounds. The company announced that it has thousands of tons in stock, for which there appears to be no early consumption.[3]

[2] Gremier, P., Wet Process For Refining Process: Canadian Min. Jour., vol. 71, No. 4, April 1950, pp. 47–52.
[3] Chemical Age, vol. 163, No. 1624, Aug. 26, 1950, p. 301.

TABLE 6.—World production of white arsenic, by countries, 1945–50,[1] in metric tons

[Compiled by Berenice B. Mitchell]

Country [1]	1945	1946	1947	1948	1949	1950
Argentina [2]	42	(3)	(3)	(3)	(3)	(3)
Australia	2,021	1,651	1,210	520	257	(3)
Belgium-Luxembourg (exports)	----------	(3)	(3)	151	527	1,909
Brazil	962	829	1,001	984	959	(3)
Canada	928	338	357	527	239	245
France	1,530	3,140	2,510	3,000	(3)	(3)
Greece	----------	8	14	18	13	(3)
Italy	100	1,420	1,620	1,730	1,440	[4] 520
Japan	(3)	1,092	1,407	1,765	2,489	1,627
Mexico	15,013	9,648	9,685	7,571	3,576	8,987
New Zealand	17	18	8	8	19	(3)
Peru	3,200	753	608	1,011	980	(3)
Portugal	243	508	1,005	1,616	[5] 744	801
Southern Rhodesia	624	216	416	283	148	114
Spain	393	440	484	573	124	(3)
Sweden	6,119	10,109	16,088	16,979	(3)	(3)
Union of South Africa	100	12	3	13	----------	----------
United Kingdom [6]	117	147	91	(3)	(3)	(3)
United States	22,089	9,263	17,014	16,909	11,607	12,041
Total [7]	55,600	41,000	56,000	55,000	37,000	43,000

[1] Arsenic is also believed to be produced in Austria, China, Czechoslovakia, Germany, Hungary, Iran, Korea, Turkey, and U. S. S. R., but data are not available.
[2] Arsenic content of ore mined.
[3] Data not available; estimate by author of chapter included in total.
[4] January to September, inclusive.
[5] Exports.
[6] White arsenic, including arsenic soot.
[7] Estimated by author of chapter. Total includes estimates for Austria and Germany, but no estimates are included for other countries listed in footnote 1.

Asbestos

By Oliver Bowles and F. M. Barsigian

GENERAL SUMMARY

ALTHOUGH production of asbestos in Canada, our principal source of supply, reached an all-time high in 1950, the demand for asbestos products steadily increased, and virtually all grades of asbestos were in short supply. Shortages were more acute for African than for Canadian fibers.

Domestic production nearly equaled the record output of 1949 but amounted to only about 6 percent of our domestic requirements. One mine in Vermont produces the bulk of the domestic output. Relatively small quantities of chrysotile, some of it of spinning grade, are produced in Arizona, and a small output of amphibole asbestos is recorded from several States.

Imports and apparent consumption exceeded all previous records. Imports from Canada attained an all-time high. Imports of low-iron chrysotile from Southern Rhodesia, however, and amosite and crocidolite from the Union of South Africa, were much smaller in 1950 than in 1949. This has created a rather critical situation with respect to these grades, which are obtainable from virtually no other foreign sources. All of the amosite and nearly all of the crocidolite are obtained from the Union of South Africa.

Industrial demand, much of it for defense orders, was so high that it was difficult to obtain material for the National Stockpile. Some progress has been made in developing substitutes. Prices of Canadian crudes remained constant throughout the year, but those of other grades advanced substantially during the fourth quarter. Prices of all grades were again advanced early in 1951.

TABLE 1.—Salient statistics of the asbestos industry in the United States, 1946–50

	1946	1947	1948	1949	1950
Domestic asbestos:					
Produced............short tons..	14,426	25,139	37,237	42,918	41,358
Sold or used............do....	14,075	24,035	37,092	43,387	42,434
Value....................	$504,764	$918,558	$1,806,261	$2,614,416	$2,925,050
Imports (unmanufactured) short tons..	[1] 455,663	594,839	647,881	[1] 509,366	705,253
Value....................	[1] $18,770,817	$29,821,519	$37,974,092	$33,939,582	$47,250,245
Exports (unmanufactured) short tons..	11,011	[1] 2,036	6,530	17,621	18,901
Value....................	$1,395,367	[1] $308,414	$1,173,259	$3,618,703	$3,619,428
Apparent consumption...short tons..	[1] 458,727	[1] 616,838	678,443	[1] 535,132	728,786
Exports of asbestos products [2]........	$8,169,466	$11,135,113	$9,321,351	$9,666,560	$8,111,922

[1] Revised figure.
[2] 1946–49 figures revised to exclude value of "Magnesia and manufactures." *See* footnote 1, table 6.

PRODUCTION

Domestic production and sales of asbestos were a little lower in 1950 than in 1949. Chrysotile was produced in Vermont and Arizona and amphibole in California, Georgia, North Carolina, and Oregon.

TABLE 2.—Asbestos sold or used by producers in the United States, 1946–50, by varieties

Year	Chrysotile		Amphibole		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	13,645	$499,260	430	$5,504	14,075	$504,764
1947	23,586	912,340	449	6,218	24,035	918,558
1948	(1)	(1)	(1)	(1)	37,092	1,806,261
1949	(1)	(1)	(1)	(1)	43,387	2,614,416
1950	(1)	(1)	(1)	(1)	42,434	2,925,050

[1] Bureau of Mines not at liberty to publish figure separately.

Alaska.—No asbestos was produced in 1950 from the Alaska deposits in the Kobuk River district, but Philip S. Hoyt, P. O. Box 83, Aguila, Ariz., reported that in 1951 he planned production of asbestos suitable for filter fiber.

Arizona.—Production of chrysotile in Arizona almost doubled in 1950, and some high-quality material suitable for the National Stockpile was recovered. The following firms and individuals were active: Arthur Enders, P. O. Box 362, Globe; Gila Asbestos Co., Globe (started operations in March 1950 at the Wilson Cherry Creek mine near Young); Kyle Asbestos Mines of Arizona, P. O. Box 302, Globe; Phillips Asbestos Mines, Drawer 71, Globe; and R. G. Robertson, 1417 East MacDowell St., Phoenix (Bear Canyon mine on the San Carlos Indian Reservation).

California.—In Inyo County production of amphibole was reported by the Huntley Industrial Minerals, Inc., P. O. Box 305, Bishop. Powhatan Mining Co., 6721 Windsor Mill Road, Baltimore 7, Md., produced tremolite from the Sylvester mine near Hazel Creek in Shasta County. Sales of tremolite were reported by the Loma Blanca Mines, Inc., from Shasta County. There was no commercial production from this operation in 1950; in November 1950 the lease expired, and the property reverted to the owners. The Blas Asbestos Corp., La Moine, Calif., did not operate in 1950, and in August 1950, Johns-Manville Corp. took an option on the property.

Georgia.—Powhatan Mining Co. produced amphibole in Meriwether County, Ga., near Gay. Industrial Minerals Corp. reported development work on tremolite in Rabun County.

Montana.—Interstate Products Co., Inc., has done some development work on its amphibole-asbestos properties in the Gallatin Canyon.

North Carolina.—Powhatan Mining Co. produced amphibole in Transylvania County near Lake Toxaway. Industrial Minerals Corp., Asheville, continued development work on amphibole deposits in Macon and Yancey Counties.

New Mexico.—According to report, W. S. Beall, of Las Vegas, is developing a tremolite-asbestos deposit in the Guienas Canyon district 8 miles southeast of the Elk Mountain mining district, west of Las Vegas.

Oregon.—Philip S. Hoyt, P. O. Box 83, Aguila, Ariz., reported production in Oregon of asbestos suitable for use as filter fiber.

Vermont.—The Vermont Asbestos Mines Division of the Ruberoid Co., 500 Fifth Ave., New York 18, N. Y., the largest producer of chrysotile in the United States, prepared a range of well-graded fibers in its new mill, which began operation in 1949. The company used part of the output in its own asbestos-products plants.

CONSUMPTION AND USES

As shown in table 3, the apparent consumption of raw asbestos in the United States was about 36 percent higher in 1950 than in 1949; it was, in fact, the highest in the history of the industry. For both textiles and brake linings the demand was greater than the supply. Insulation products and building materials were in strong demand. The relationships between the consumption of asbestos, industrial production, and the volume of building construction are shown graphically in figure 1.

Articles on asbestos that appeared during the year included one on preparation of raw asbestos in the textile plant and the processes

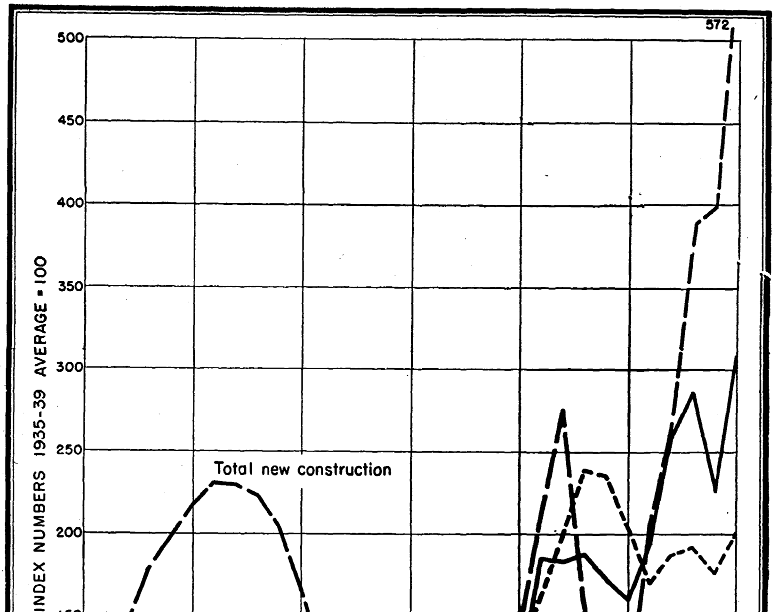

FIGURE 1.—Consumption of asbestos compared with total new construction and industrial production, 1920-50. Statistics on value of construction from Bureau of Foreign and Domestic Commerce and on industrial production from Federal Reserve Board.

employed in carding and spinning.[1] A wider use of asbestos in air filtering is indicated in another article.[2] There was also published a general summary of facts about asbestos and its industrial applications.[3]

TABLE 3.—Apparent consumption of raw asbestos in the United States, 1941–50

Year	Short tons	Value	Year	Short tons	Value
1941	438,741	$18,309,005	1946 [1]	458,727	$17,880,214
1942	433,949	21,582,096	1947 [1]	616,838	30,431,663
1943	445,902	23,351,483	1948	678,443	38,607,094
1944	389,241	18,864,291	1949	[1] 535,132	32,935,295
1945	378,030	15,926,622	1950	728,786	46,555,867

[1] Revised figure.

Foreign as well as domestic demand for all grades of raw asbestos was at a high level during 1950. Rehabilitation of asbestos-products plants in continental Europe increased the demand for both Canadian and African fibers in that area. The expanding military program resulted in numerous defense orders for products in which strategic grades of asbestos are used; in consequence, there was a shortage both of the spinning grades of Canadian fiber and the special grades that originate in Africa. The urgent need for increased production of asbestos, especially in the United States, stimulated active interest in exploration, but no promising results had as yet been reported.

PRICES

As quoted in the magazine Asbestos, the following prices, in short tons, f. o. b. mines, were constant throughout the year for Canadian asbestos: Group 1 (Crude No. 1) $960–$1,050; group 2 (Crude No. 2, Crude Run-of-Mine, and Sundry), $400–$550. Other grades were constant in price from January to October as follows: Group 3 (Spinning Fiber), $232–$425; group 4 (Shingle Fiber), $95.50–$141; group 5 (Paper Fiber), $78.50–$88; group 6 (Waste, Stucco or Plaster), $58; group 7 (Refuse or Shorts), $28–$52. From November to the end of the year the latter groups were quoted as follows: Group 3 (Spinning Fiber), $250–$425; group 4 (Shingle Fiber), $105–$155; group 5 (Paper Fiber), $85–$97; group 6 (Waste, Stucco, or Plaster), $63; group 7 (Refuse or Shorts), $30–$57.

Prices of Vermont asbestos, in short tons f. o. b. Hyde Park or Morrisville, Vt., were constant from January to October 1950 as follows: Shingle Fibers, $111.50–$124, Paper Fiber, $79–$96.50, Waste, Stucco, or Plaster, $59; Refuse or Shorts, $28.50–$52.50. From November to the end of the year, prices were advanced as follows: Shingle Fiber, $122.65–$148.50; Paper Fiber, $86.90–$106.15; Waste, Stucco, or Plaster, $64.90; Refuse or Shorts, $31.20–$57.60. Early in 1951 Canadian prices were advanced substantially, but Vermont prices were frozen at the December level.

[1] Bloomfield, Gerd M., Speaking About Asbestos Yarn: Asbestos, vol. 31, No. 12, June 1950, pp. 4–10; vol. 32, No. 1, July 1950, pp. 6–12; vol. 32, No. 2, August 1950, pp. 10–13.
[2] Asbestos, The Air-Filtering Industry: Vol. 32, No. 1, July 1950, pp. 14–15.
[3] Bowles, Oliver, Varieties and Uses of Asbestos: Asbestos, vol. 32, No. 3, September 1950, pp. 4–12.

FOREIGN TRADE [4]

Imports.—As the United States is the principal consumer of asbestos and produces only a small percentage (6 percent in 1950) of its requirements, large tonnages are imported. In 1950 imports were 38 percent higher than in 1949. Of this total, 96 percent came from Canada, 2 percent from the Union of South Africa, and about 1½ percent from Southern Rhodesia. On a value basis, the African percentages are much higher.

TABLE 4.—Asbestos (unmanufactured) imported for consumption in the United States, 1946–50, by countries and classes

[U. S. Department of Commerce]

Country	Crude (including blue fiber)		Mill fibers		Short fibers		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	[1] 13,878	[1] $1,775,764	153,235	$10,391,013	288,550	$6,604,040	[1] 455,663	[1] $18,770,817
1947	35,951	4,810,852	162,405	13,957,307	396,483	11,053,360	594,839	29,821,519
1948	38,088	5,420,600	176,908	18,028,161	432,885	14,525,331	647,881	37,974,092
1949								
Australia	249	58,965	-------	-------	-------	-------	249	58,965
Bolivia	69	9,927	-------	-------	-------	-------	69	9,927
Canada	[2] 846	[2] 313,328	[2] 127,347	[2] 14,437,052	342,590	12,721,533	[2] 470,783	27,471,913
Italy	[2] 24	1,211	76	8,786	-------	-------	[2] 100	9,997
Portugal	(3)	65	-------	-------	-------	-------	(3)	65
Southern British Africa	[2] 497	97,580	-------	-------	-------	-------	[2] 497	97,580
Southern Rhodesia [4]	[2] 13,641	[2] 2,979,827	81	30,395	-------	-------	[2] 13,722	[2] 3,010,222
Spain	(3)	27	-------	-------	-------	-------	(3)	27
Union of South Africa [5]	[2] 22,720	[2] 3,123,731	-------	-------	-------	-------	[2] 22,720	[2] 3,123,731
U. S. S. R.	1,221	156,850	-------	-------	-------	-------	1,221	156,850
United Kingdom	[2] 5	278	-------	-------	-------	-------	[2] 5	278
Venezuela	-------	-------	(3)	27	-------	-------	(3)	27
Total, 1949	[2] 39,272	[2] 6,741,789	[2] 127,504	[2] 14,476,260	342,590	12,721,533	[1] 509,366	33,939,582
1950								
Australia	273	60,882	-------	-------	-------	-------	273	60,882
Bolivia	39	4,894	-------	-------	-------	-------	39	4,894
Canada	830	347,727	177,865	21,108,380	499,663	20,041,799	678,358	41,497,906
Chile	65	21,225	-------	-------	-------	-------	65	21,225
Finland	1	135	-------	-------	-------	-------	1	135
Italy	5	2,227	14	12,184	-------	-------	19	14,411
Portugal	40	3,137	-------	-------	-------	-------	40	3,137
Southern British Africa	1,330	300,083	-------	-------	-------	-------	1,330	300,083
Southern Rhodesia [4]	9,336	2,813,041	556	286,825	-------	-------	9,892	3,099,866
Union of South Africa [5]	14,658	2,164,504	147	12,302	-------	-------	14,805	2,176,806
U. S. S. R.	426	69,180	-------	-------	-------	-------	426	69,180
United Kingdom	1	300	4	1,420	-------	-------	5	1,720
Total, 1950	27,004	5,787,335	178,586	21,421,111	499,663	20,041,799	705,253	47,250,245

[1] Revised figure. Changes in crude asbestos entries and country totals for 1946 in Minerals Yearbook, 1947, p. 147, are as follows: China (39 short tons, $3,000), total (39 short tons, $3,000); Southern Rhodesia (4,214 short tons, $762,820), total (4,438 short tons, $788,051); Union of South Africa (6,324 short tons, $633,312), total (6,324 short tons, $633,312), grand total, crude (13,878 short tons, $1,775,764), grand total, all countries (455,663 short tons, $18,770,817).

[2] Revised figure.

[3] Less than 0.5 ton.

[4] Includes 579 tons ($119,744) of chrysotile crude in 1949 and 207 tons ($44,895) in 1950 credited by U. S. Department of Commerce to Mozambique. Since Mozambique is not an asbestos producer, it is assumed that this actually originated in Southern Rhodesia.

[5] Includes in 1949, 2,930 tons ($113,279) of amosite crude, and in 1950, 1,000 tons ($96,075) of amosite crude and 10 tons ($2,715) of blue (crocidolite) crudes credited by U. S. Department of Commerce to Mozambique. Since Mozambique is not an asbestos producer, it is assumed that this originated in the Union of South Africa.

[4] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Exports.—Exports of unmanufactured asbestos were exceptionally high in 1949 and 1950. Exports of asbestos products, however, declined somewhat from 1949.

TABLE 5.—Asbestos and asbestos products exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Unmanufactured asbestos		Asbestos products [1]
	Short tons	Value	Value
1946	11,011	$1,395,367	$8,169,466
1947	[2] 2,036	[2] 308,414	11,135,113
1948	6,530	1,173,259	9,321,351
1949	17,621	3,618,703	9,666,560
1950	18,901	3,619,428	8,111,922

[1] 1946–49 figures revised to exclude value of "Magnesia and manufactures." *See* footnote 1, table 6.
[2] Revised figure.

TABLE 6.—Asbestos and asbestos products exported from the United States, 1949–50, by kinds

[U. S. Department of Commerce]

Product	1949		1950	
	Quantity	Value	Quantity	Value
Unmanufactured asbestos:				
Crude and spinning fibers.....short tons..	6,591	$1,741,984	6,255	$1,682,403
Nonspinning fibers.....do....	5,541	1,327,876	11,078	1,803,457
Waste and refuse.....do....	5,489	548,843	1,568	133,568
Total unmanufactured.....do....	17,621	3,618,703	18,901	3,619,428
Asbestos products: [1]				
Brake blocks.....do....	142	275,293	219	397,147
Brake lining:				
Molded and semimolded.....do....	1,543	2,641,045	1,751	2,686,954
Not molded.....linear feet..	763,961	479,645	532,358	342,542
Clutch facing.....number..	934,820	523,756	1,055,685	577,032
Construction materials.....short tons..	21,362	2,418,172	12,925	1,755,149
Pipe covering and cement.....do....	4,336	963,599	1,143	205,185
Textiles, yarn, packing, and sheets.....do....	1,209	1,891,831	1,215	1,814,105
Manufactures, n. e. s.	(2)	473,219	(2)	333,808
Total	----------	9,666,560	----------	8,111,922

[1] The item "Magnesia and manufactures" carried in this table for many years has been omitted because it includes a great variety of products only one of which (pipe covering) contains asbestos. The value of exports of "Magnesia and manufactures" was as follows: 1949—$1,231,457; 1950—$830,674.
[2] Quantity not recorded.

TECHNOLOGY

Further progress was made in developing processes for removing iron from Canadian asbestos to make it a suitable substitute for the low-iron chrysotile obtained in Southern Rhodesia. The shrinkage in imports from Southern Rhodesia was a powerful stimulus for such research. The Johns-Manville Corp. began making low-iron "Quinterra" asbestos paper in a new mill designed for this purpose at Tilton N. H. Raybestos-Manhattan, Inc., continued its research and pilot-plant work on a low-iron asbestos paper, "Novabestos." The Naval

Research Laboratory in Washington, D. C. also developed a process, employing the centrifugal action of water in a papermaker's "Vortrap," which accomplishes a remarkable reduction in the iron content of Canadian fiber.

Considerable work was done in the Bureau of Mines Electrotechnical Laboratories at Norris, Tenn., on asbestos synthesis, particularly in the field of the amphiboles, but no reports have yet been issued.

The Asbestos Textile Institute has maintained a research fellowship at Rutgers University since 1946. One of its accomplishments has been development of a testing machine for evaluating the resistance of asbestos textiles to abrasion and flexing action.

WORLD REVIEW

Although official statistics are too incomplete to permit an accurate estimate of total production at this time, it appears that for the first time in history world output exceeded a million tons in 1950. Canada produced about two-thirds of this total.

TABLE 7.—World production of asbestos by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Argentina	153	(2)	(2)	(2)	(2)	(2)
Australia:						
New South Wales	2,674	241	290	330	284	[3] 289
South Australia	7	8	40	41	17	(2)
Tasmania	281	----	----	----	----	----
Western Australia	1,109	380	1,069	977	1,318	[3] 494
Bolivia (exports)	61	----	141	147	182	(2)
Brazil	2,723	1,214	2.631	1,304	(2)	(2)
Canada (sales) [4]	423,559	506,371	600,391	650,239	521,543	794,095
Chile	313	280	(2)	150	291	(2)
Cyprus	3,182	4,142	6,795	8,106	12,556	(2)
Egypt	85	65	1.015	1,625	117	260
Finland [5]	4,197	5,781	6,351	10,818	8,395	(2)
France	400	575	934	104	1,059	(2)
French Indochina	----	----	----	----	(2)	(2)
French Morocco	480	446	825	399	402	511
India	833	312	123	28	148	(2)
Italy	5,222	8,814	10,719	13,044	15,365	21,433
Japan	8,044	3,997	4,249	4,809	5,456	4,948
Kenya	389	165	582	510	716	(2)
Korea:						
Northern	1,303	(2)	(2)	(2)	(2)	(2)
Southern		----	----	----	----	(2)
Madagascar	1	1	(6)	(6)	2	(2)
New Zealand	2	----	----	----	----	(2)
Portugal	20	12	91	414	101	271
Southern Rhodesia	51,068	50,686	49,073	62,502	72.246	64,888
Spain	----	----	----	35	40	(2)
Swaziland	21,243	29,155	25,360	29.421	30,814	29,635
Switzerland	35	40	----	----	----	(2)
Turkey	138	55	36	203	170	(2)
Union of South Africa	25,597	18,348	27,344	41,490	64,334	79,298
United States (sold or used by producers)	11,091	12.769	21,804	33,649	39,360	38,495
Venezuela	(2)	65	240	192	192	(2)
Total (estimate)	632,000	724,000	872,000	995,000	895,000	1,206,000

[1] In addition to countries listed asbestos is produced in Algeria, Bulgaria, China, Czechoslovakia, Uganda, and U. S. S. R. Estimates by authors of the chapter are included in total.
[2] Data not available; estimate by authors of the chapter included in total.
[3] January to June, inclusive.
[4] Exclusive of sand, gravel, and stone (waste rock only), production of which is reported as follows: 1945, 4,635 tons; 1946, 5,749 tons; 1947, 8,718 tons; 1948, 40,066 tons; 1949, 32,015 tons; 1950 data not available.
[5] Includes asbestos flour.
[6] Less than 1 ton.

CANADA

Canadian asbestos production in 1950 recovered remarkably from the low output of 1949, caused by a prolonged strike. Shipments of 875,344 short tons, valued at $65,854,568, compared with 574,906 tons, valued at $39,746,072, in 1949 were a gain of 52 percent in quantity and 66 percent in value. Further expansion was foreseen for 1951 and 1952. The Asbestos Corp. almost doubled its mill capacity at the British Canadian mine by building a new rock mill and reconditioning an old one.[5] Johnson's Co. was building a new mill at Black Lake with a daily capacity of 4,000 tons of rock, but this was not expected to be in operation before the end of 1951. Canadian Johns-Manville Corp. made satisfactory progress in its extensive block-caving development and expected to have substantial production from three blocks during 1951. United Asbestos Corp., Ltd., has extensive properties near and under Black Lake, and a shaft has been sunk. According to report, drilling results were quite encouraging, but production was still in the indefinite future.

In 1950, for the first time, a substantial output of asbestos was indicated for areas outside of Quebec. The completed mill of the Canadian Johns-Manville Corp. in Munro Township, Cochrane District, Ontario, began operation in April. A detailed description of the deposit, and also of the mine and mill, was published.[6] Teegana Mines, Ltd., made some progress in development work and erection of a mill on a property near South Porcupine in Deloro Township, Ontario. This property had produced a small tonnage of chrysotile asbestos many years earlier.[7]

Diamond drilling established the presence of a deposit of good-quality chrysotile in northern British Columbia. Conwest-Exploration Co., Ltd., Toronto, Canada, planned extensive development work during 1951.[8] These deposits have been described in some detail.[9]

TABLE 8.—Sales of asbestos in Canada, 1949–50, by grades

[Quebec Department of Mines]

	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Grade:						
Crudes	652	$420,188	$644.46	904	$587,569	$649.97
Fibers	194,583	24,463,703	125.72	305,194	41,002,785	134.35
Shorts	379,671	14,862,181	39.14	569,246	24,264,214	42.63
Total	574,906	39,746,072	69.13	875,344	65,854,568	75.23
Rock mined	8,218,045			12,210,780		
Rock milled	5,671,085			8,635,036		

[5] Asbury, W. Nowers, Industrial Mineral Notes: Canadian Min. and Met. Bull., vol. 43, No. 455, March 1950, p. 131.
[6] Northern Miner, New Asbestos Mine in Production: Vol. 36, No. 11, June 8, 1950, pp. 1–4.
[7] Northern Miner, Asbestos Producer for Porcupine: Vol. 36, No. 25, Sept. 14, 1950, pp. 17–19
[8] Communication from M. F. Goudge, Ottawa, Can.
[9] Asbestos, Asbestos in British Columbia: Vol. 32, No. 5, November 1950, pp. 16–20.

AFRICA

Southern Rhodesia.—As indicated in table 9 asbestos production in Southern Rhodesia in 1950 declined considerably below the level of 1949 but was higher than in 1948. Increased prices are reflected in the substantial gain in value of sales in 1950. The bulk of the production is obtained from four mines in the Shabani area—the Nil Desperandum, Birthday, 170, and 177. A smaller output is obtained from the King and Gath mines in the Mashaba district and the Croft mine in the Filabusi district. Nearly all of the production is in the hands of the Rhodesian and General Asbestos Corp., a subsidiary of Turner & Newall, Ltd., of Manchester, England. The strong demand for low-iron chrysotile stimulated increasing activity in exploration and development of other asbestos deposits in Southern Rhodesia.

TABLE 9.—Asbestos produced in Southern Rhodesia, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	56,293	£1,788,386	1948	68,897	£2,604,623
1946	55,872	1,676,503	1949	79,638	3,986,703
1947	54,094	1,738,484	1950	71,527	4,615,490

Union of South Africa.—Asbestos production in the Union, as indicated in table 11, made remarkable gains in 1949 and 1950. The amosite expansion program is reflected in an increase of about 40 percent in output in both 1949 and 1950 compared with 1948. The chrysotile output was nearly twice as great in 1950 as in 1949. This increase probably was due to growing activity in the new mine and mill of Kinlock Asbestos, Ltd., about 25 miles from Barberton. The output of crocidolite (blue asbestos) gained 44 percent in 1950 over 1949. Milling methods for amosite and blue asbestos were described.[10]

Swaziland.—The Havelock mine in Swaziland close to the Transvaal border has become a substantial producer of chrysotile. Output in 1950 was slightly lower than in 1949.

Madagascar.—An unusual type of peach-colored asbestos occurs in Madagascar. It has been identified by three independent laboratories

TABLE 10.—Asbestos produced in and exported from the Union of South Africa, 1946–50 [1]

	Production (short tons)			Exports	
	Transvaal	Cape Province	Total	Short tons	Value
1946	12,636	7,589	20,225	21,481	£557,008
1947	21,959	8,183	30,142	33,237	927,371
1948	37,434	8,301	45,735	38,550	1,138,792
1949	58,918	11,999	70,917	63,428	2,600,323
1950	71,881	15,211	[2] 87,412	[3] 50,272	[3] 2,456,396

[1] Data from Union of South Africa, Department of Mines, quarterly and monthly reports.
[2] Includes 320 tons produced in Natal.
[3] January to September, inclusive.

[10] Mining and Industrial Magazine, Milling South African Amosite and Blue Asbestos Fibers: Vol. 50, No. 3, March 1950, pp. 147–149.

TABLE 11.—Asbestos produced in the Union of South Africa, 1945–50, by varieties and sources, in short tons [1]

Variety and source	1945	1946	1947	1948	1949	1950
Amosite (Transvaal)	16,737	9,838	18,780	30,372	41,974	42,391
Chrysotile (Transvaal)	1,765	1,666	2,253	4,441	7,609	14,015
Chrysotile (Natal)	----	----	----	----	----	320
Blue (Transvaal)	1,471	1,102	896	2,608	9,181	15,386
Blue (Cape)	8,200	7,589	8,183	8,301	11,999	15,211
Anthophyllite (Transvaal)	43	30	30	13	154	89
Total	28,216	20,225	30,142	45,735	70,917	87,412

[1] Data from Union of South Africa, Department of Mines, quarterly and monthly reports.

as anthophyllite; but, unlike most anthophyllites the fibers are as strong and flexible as those of chrysotile. The location and extent of the deposit have not yet been determined.

OTHER COUNTRIES

Corsica.—It is reported that the Canari mine produced 1,050 tons of asbestos during the first quarter of 1950.[11]

Cyprus.—Conditions in the Cyprus mines, which produce substantial quantities of short-fiber chrysotile, were described briefly.[12] Production figures for 1950 are not yet available, but the industry made large gains in 1949 when eight mills were in operation. According to a report, the fiber recovered is about 1 percent of the total rock quarried and about 3 percent of the mill rock.[13]

Italy.—Italian output of asbestos has expanded greatly during recent years. About 90 percent of production is from the Turin and Dondrio mines.[14]

Japan.—Both amphibole and chrysotile asbestos occur in Japan, but production is confined to short-fiber chrysotile. It was reported that asbestos mining there is unprofitable.[15] Mining activities are supported by the profits of asbestos-products plants.

[11] Mining World, vol. 12, No. 9, August 1950, p. 55.
[12] Asbestos, Cyprus Asbestos Mines Ltd.: Vol. 31, No. 12, June 1950, p. 10.
[13] The Mining Journal, Cyprus Mineral Output Booms in 1949: Vol. 234, No. 5986, May 1950, p. 480.
[14] Mining World, vol. 12, No. 1, January 1950, p. 50.
[15] Lee, Donald E., A Further Report on Japan: Asbestos, vol. 31, No. 8, February 1950, pp. 10–14.

Asphalt and Related Bitumens

By A. H. Redfield and Elizabeth Sims

GENERAL SUMMARY

DOMESTIC demand[1] for petroleum asphalt (including small quantities of imported lake asphalt and grahamite) was 19 percent larger in 1950 than in 1949, but export demand was nearly 39 percent lower. As export demand was little more in 1950 than 1 percent of the total demand, however, the total demand increased 17 percent from 1949 to 1950. In numerical terms, an increase of 1,678,777 tons in domestic demand, offset in part by a decrease of 91,227 tons in export demand, was more than met by an increase of 1,678,737 tons in refinery production and an increase of 111,358 tons in imports of petroleum and lake asphalt. As a result, stocks held at the refineries were increased by 68,179 tons during 1950, compared with a withdrawal of 134,366 tons from stocks during 1949.

TABLE 1.—Supply and distribution of asphalt and related bitumens in the United States, 1949–50, in short tons

	1949	1950
SUPPLY		
Native asphalt and related bitumens:		
Production	1,202,393	1,250,862
Imports (chiefly lake asphalt)	4,109	5,863
Petroleum asphalt (excluding road oil):		
Production	8,910,362	10,589,099
Imports	213,967	323,571
Stocks, Jan. 1	1,028,548	894,182
Total supply	11,359,379	13,063,577
DISTRIBUTION		
Native asphalt and related bitumens:		
Domestic demand[1]	1,185,721	1,232,045
Exports	16,672	18,817
Petroleum asphalt (excluding road oil):		
Indicated (apparent) domestic demand[1]	9,028,348	10,707,125
Exports	234,456	143,229
Stocks, Dec. 31	894,182	962,361
Total distribution	11,359,379	13,063,577

[1] Domestic demand for native asphalt excludes, and that for petroleum asphalt includes, lake asphalt, since this has the same sorts of uses as the manufactured product.

NATIVE ASPHALT AND BITUMENS

Bituminous Rock.—Sales of bituminous rock by producers in the United States increased in tonnage from 1,150,931 short tons in 1949 to 1,184,676 tons in 1950 but decreased in value from $4,264,989 in

[1] The term "domestic demand" as used in this chapter means apparent consumption, that is, production plus net imports and changes in refiners' stocks.

1949 to $3,522,308 in 1950. Bituminous limestone amounted to 920,874 tons valued at $2,536,912 in 1949 and 1,071,955 tons valued at $2,737,056 in 1950. Bituminous sandstone totaled 230,057 tons valued at $1,728,077 in 1949 and 112,721 tons valued at $785,252 in 1950. Average sales values of bituminous limestone decreased from $2.75 per short ton in 1949 to $2.55 per ton in 1950. Average sales values of bituminous sandstone decreased from $7.51 per ton in 1949 to $6.97 per ton in 1950.

Gilsonite.—Sales of gilsonite by producers in northeastern Utah increased from 51,462 short tons valued at $1,303,584 in 1949 to 66,186 tons valued at $1,774,330 in 1950. The average sales value per ton at the mine or railhead increased from $25.33 in 1949 to $26.81 in 1950.

MANUFACTURED OR PETROLEUM ASPHALT

Production.—Petroleum refineries in the United States produced 10,589,100 short tons of asphalt in 1950, an increase of 19 percent over the 8,910,400 tons produced in 1949. The increases were general, but were greatest in the East Coast, Louisiana-Arkansas, and Oklahoma-Kansas-Missouri districts.

Stocks.—Stocks of asphalt held at refineries increased nearly 8 percent from 894,200 short tons on December 31, 1949, to 962,400 tons on December 31, 1950. The principal increases were in the East Coast, Texas Gulf Coast, Indiana-Illinois-Kentucky, etc., Arkansas-Louisiana Inland, and Louisiana Gulf Coast districts. On the other hand, asphalt stocks were reduced in the Appalachian, California, and Texas Inland districts.

TABLE 2.—Supply and disposition of petroleum asphalt (exclusive of road oil) at refineries in the United States in 1950, by refinery districts, in short tons

District	Production	Receipts [1]	Stocks		Consumption by producers, transfers, [2] losses, and exports	Sales to domestic consumers
			Jan. 1	Dec. 31		
East Coast	2,750,200	457,500	128,700	149,800	193,100	2,993,500
Appalachian	376,200	41,100	40,700	24,000	28,700	405,300
Indiana, Illinois, Kentucky, etc.	1,934,400	60,300	186,500	198,200	273,500	1,709,500
Oklahoma, Kansas, Missouri	1,046,000	96,000	127,100	129,500	98,000	1,041,600
Texas:						
Gulf Coast	545,200	17,500	45,300	66,100	34,900	507,000
Inland	602,200	52,100	50,200	49,100	70,600	584,800
Total Texas	1,147,400	69,600	95,500	115,200	105,500	1,091,800
Louisiana-Arkansas:						
Lousiana Gulf Coast	638,000		62,200	76,000	68,700	555,500
Arkansas, Louisiana Inland	623,300	58,200	79,800	96,200	35,000	630,100
Total Louisiana-Arkansas	1,261,300	58,200	142,000	172,200	103,700	1,185,600
Rocky Mountain	413,400	126,700	50,200	61,100	30,000	499,200
California	1,660,200		123,500	112,400	69,300	1,602,000
Total: 1950	10,589,100	909,400	894,200	962,400	901,800	10,528,500
1949	8,910,400	958,000	1,028,500	894,200	1,081,600	8,921,100

[1] Receipts from intraindustry refinery transfers, addition of other petroleum products blended to make cut-back asphalts, imports, and transfers from stocks formerly not classified as asphalt.
[2] Transfers between refineries and transfers of asphalt to stocks not so classified.

Sales.—Sales of petroleum asphalt to domestic consumers increased 18 percent in quantity from 1949 to 1950 and 9 percent in value. The average sales value per short ton decreased from $18.21 in 1949 to $16.87 in 1950. The greatest increases in tonnage sold were in the East Coast, Louisiana Gulf Coast, Oklahoma-Kansas-Missouri, Texas Inland, California, and Rocky Mountain districts. The only exception to the general increase in asphalt sales was in the Texas Gulf Coast district.

Of the total petroleum asphalt sold to domestic consumers in 1950, 25 percent was manufactured from foreign petroleum, imported mainly from Venezuela, Colombia, and Mexico, compared with 23 percent in 1949. Although runs of foreign crude to stills increased 14 percent from 1949 to 1950, sales of asphalt made from foreign crude increased 17 percent from 1949 to 1950. Of the foreign crude processed, 8 percent (revised figure) was converted to asphalt in 1949 and a little over 8 percent in 1950. Ninety-four percent of the asphalt made from foreign petroleum in 1950 and all of it in 1949 was manufactured in East Coast refineries.

TABLE 3.—Asphalt and asphalt material (exclusive of road oil) sold at petroleum refineries to domestic consumers in the United States in 1950, by form and use

[Value f. o. b. refinery]

Form and use	From domestic petroleum		From foreign petroleum		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Solid and semisolid products of less than 200 penetration:						
Asphalt for—						
Paving	2,169,516	$33,698,823	1,145,541	$20,515,627	3,315,057	$54,214,450
Roofing	1,250,086	20,603,192	601,085	10,945,822	1,851,171	31,549,014
Waterproofing	142,173	2,903,640	15,482	299,950	157,655	3,203,590
Blending with rubber	14,947	356,549	11,872	302,277	26,819	658,826
Briquetting	150,652	2,660,580	13,087	234,720	163,739	2,895,300
Mastic and mastic cake	2,152	53,315	11	285	2,163	53,600
Pipe coatings	33,678	768,184	3,961	101,012	37,639	869,196
Molding compounds	74,004	1,324,586	10,502	246,990	84,506	1,571,576
Miscellaneous uses	241,742	4,506,032	165,614	3,048,676	407,356	7,554,708
Total	4,078,950	66,874,901	1,967,155	35,695,359	6,046,105	102,570,260
Semisolid and liquid products of more than 200 penetration:						
Flux for—						
Paving	505,142	6,902,205	57,525	957,589	562,667	7,859,794
Roofing	975,354	13,426,311	20,098	319,738	995,452	13,746,049
Waterproofing	323	6,454	460	844	783	7,298
Mastic	1,929	47,212			1,929	47,212
Cut-back asphalts:						
Rapid-curing	1,035,487	18,936,022	357,501	6,579,766	1,392,988	25,515,788
Medium-curing	1,086,088	18,802,527	182,515	3,414,354	1,268,603	22,216,881
Emulsified asphalts and fluxes	101,199	2,069,405	18,290	371,287	119,489	2,440,692
Paints, enamels, japans, and lacquers	54,057	1,605,168	20,136	377,157	74,193	1,982,325
Other liquid products	66,202	1,176,264	55	1,030	66,257	1,177,294
Total	3,825,781	62,971,568	656,580	12,021,765	4,482,361	74,993,333
Grand total: 1950	7,904,731	129,846,469	2,623,735	47,717,124	10,528,466	177,563,593
1949	6,870,978	120,422,317	2,050,116	42,015,414	8,921,094	162,437,731

Highway and street construction and airport-runway surfacing used, in the form of paving asphalt, paving flux, cut-back asphalts, and asphalt emulsions, 66 percent of the total asphalt sold to domestic consumers by petroleum refineries in 1950 compared with 70 percent in 1949. Sales of all grades of asphalt devoted wholly or principally to street and road construction increased 11 percent in 1950 over 1949.

TABLE 4.—Sales of asphalt (exclusive of road oil) at petroleum refineries to domestic consumers in the United States, 1949–50, by refinery districts

District	1949		1950	
	Short tons	Value	Short tons	Value
East Coast	2,490,759	$51,322,977	2,993,481	$54,761,544
Appalachian	383,989	8,199,775	405,248	8,153,349
Indiana, Illinois, Kentucky, etc.	1,569,490	27,504,696	1,709,444	30,171,094
Oklahoma, Kansas, Missouri	841,653	13,657,223	1,041,627	16,263,097
Texas:				
Gulf Coast	531,514	9,777,276	507,032	8,270,651
Inland	386,578	7,033,488	584,774	9,649,617
Total Texas	918,092	16,810,764	1,091,806	17,920,268
Louisiana-Arkansas:				
Louisiana Gulf Coast	326,242	5,487,076	555,538	8,204,244
Arkansas, Louisiana Inland	571,943	9,877,080	630,079	9,748,262
Total Louisiana-Arkansas	898,185	15,364,156	1,185,617	17,952,506
Rocky Mountain	364,929	5,727,228	499,221	7,084,163
California	1,453,997	23,850,912	1,602,022	25,257,572
Total United States	8,921,094	162,437,731	10,528,466	177,563,593

Roofing manufacture made the second largest demand for asphalt, absorbing 26 percent of the total sales of asphalt to domestic consumers in 1949 and 27 percent in 1950. Domestic sales of roofing asphalt and roofing flux combined increased 21 percent—from 2,351,471 short tons in 1949 to 2,846,623 tons in 1950. These figures do not include roofing asphalt and flux consumed by the refining companies in factories, owned by themselves or by affiliated companies, making prepared roofing and siding and saturated felts. Sales of prepared roofing and asphalt siding reported to the Bureau of the Census increased 18 percent—from 55,903,000 squares (revised figure) in 1949 to 65,707,000 squares in 1950—and of saturated felt 21 percent—from 521,961 short tons (revised figure) in 1949 to 633,863 tons in 1950.

282294—53——11

TABLE 5.—Asphalt and asphalt material (exclusive of road oil) sold at petroleum refineries to domestic consumers in the United States in 1950, by varieties, in short tons

	East Coast	Appalachian	Indiana-Illinois-Kentucky, etc.	Oklahoma-Kansas-Missouri	Texas	Louisiana-Arkansas	Rocky Mountain	California	Total	
									Short tons	Value
Solid and semisolid products of less than 200 penetration:										
Asphalt for—										
Paving	1, 240, 672	134, 388	363, 392	143, 527	319, 431	459, 216	123, 642	530, 789	3, 315, 057	$54, 214, 450
Roofing	747, 929	150, 270	272, 888	122, 154	98, 331	272, 172	7, 307	180, 120	1, 851, 171	31, 549, 014
Waterproofing	15, 663	1, 790	52, 232	31, 921	119	10, 649	1, 798	43, 483	157, 655	3, 203, 590
Blending with rubber	12, 797	1, 956	221	4, 055	----------	4, 817	1, 354	1, 619	26, 819	658, 826
Briquetting	15, 289	1, 398	66, 573	70, 336	----------	----------	6, 831	3, 312	163, 739	2, 895, 300
Mastic and mastic cake	1, 771	284	33	----------	----------	----------	75	----------	2, 163	53, 600
Pipe coatings	4, 443	2, 154	876	349	113	----------	100	29, 604	37, 639	869, 196
Moulding compounds	16, 942	1, 517	40, 904	468	3, 093	2, 966	14, 818	3, 798	84, 506	1, 571, 576
Miscellaneous uses	233, 576	2, 080	40, 808	48, 263	2, 166	24, 320	3, 888	52, 255	407, 356	7, 554, 708
	2, 289, 082	295, 837	837, 927	421, 073	423, 253	774, 140	159, 813	844, 980	6, 046, 105	102, 570, 260
Semisolid and liquid products of more than 200 penetration:										
Flux for—										
Paving	53, 204	5, 047	49, 680	22, 099	104, 347	87, 139	34, 162	206, 989	562, 667	7, 859, 794
Roofing	23, 908	255	415, 034	162, 033	103, 980	26, 723	2, 301	261, 218	995, 452	13, 746, 049
Waterproofing	460	----------	----------	----------	----------	----------	----------	323	783	7, 298
Mastic	----------	----------	----------	----------	249	1, 680	----------	----------	1, 929	47, 212
Cut-back asphalts:										
Rapid-curing	375, 396	54, 443	179, 720	113, 775	322, 735	188, 989	98, 171	59, 759	1, 392, 988	25, 515, 788
Medium-curing	202, 935	14, 669	200, 489	283, 100	109, 225	106, 181	183, 940	168, 064	1, 268, 603	22, 216, 881
Emulsified asphalts and fluxes	26, 129	5, 216	922	7, 910	17, 173	----------	3, 152	58, 987	119, 489	2, 440, 692
Paints, enamels, japans, and lacquers	22, 312	29, 781	11, 672	2, 532	6, 510	----------	----------	1, 386	74, 193	1, 982, 325
Other liquid products	55	----------	14, 000	29, 105	4, 334	765	17, 682	316	66, 257	1, 177, 294
	704, 399	100, 411	871, 517	620, 554	668, 553	411, 477	339, 408	757, 042	4, 482, 361	74, 993, 333
Total short tons	2, 993, 481	405, 248	1, 709, 444	1, 041, 627	1, 091, 806	1, 185, 617	499, 221	1, 602, 022	10, 528, 466	----------
Total value	$54, 761, 544	$8, 153, 349	$30, 171, 094	$16, 263, 097	$17, 920, 268	$17, 952, 506	$7, 084, 163	$25, 257, 572	----------	117, 563, 593

Sales of asphalts emulsified with water were 20 percent lower in 1950 than in 1949. Petroleum refineries sold 74,151 short tons (17,469,975 gallons) valued at $1,495,574 in 1949 and 119,489 tons (28,151,609 gallons) valued at $2,440,692 in 1950. In addition, 113,199,203 gallons valued at $13,482,130 in 1949 and 76,558,691 gallons valued at $9,323,628 in 1950 were sold by secondary producers that purchased asphalt from petroleum refineries and manufactured it into emulsions. Accordingly, total known sales of emulsified asphalts and fluxes decreased 20 percent in quantity—from 130,669,178 gallons (554,623 tons) in 1949 to 104,710,300 gallons (444,441 tons) in 1950—and 21 percent in value—from $14,977,704 in 1949 to $11,764,320 in 1950.

APPARENT CONSUMPTION

In contrast with a slight decline in 1949, the apparent domestic consumption of petroleum asphalt (including small quantities of imported lake asphalt and grahamite, which have similar uses and are supplementary to petroleum asphalt) increased 19 percent in 1950 over 1949. The apparent average monthly domestic consumption increased from 752,362 short tons in 1949 to 892,260 tons in 1950. Total apparent consumption was 9,028,348 short tons in 1949 and 10,707,125 tons in 1950.

DISTRIBUTION BY RAIL

Although the apparent domestic consumption of petroleum asphalt increased 19 percent from 1949 to 1950, the tonnage of asphalt terminated by class I railroads in the United States increased less than 1 percent; this amounted to 5,584,389 short tons in 1949 and 5,637,478 tons in 1950, according to the Interstate Commerce Commission. It may be noted, however, that railroad terminations of asphalt were equivalent to only 62 percent of the apparent consumption of asphalt in the United States in 1949 and 53 percent in 1950 and that considerable quantities of asphalt were delivered to consumers by water, minor railroads, and motor trucks. Accordingly, the figures in table 6 do not present a complete picture of the consumption of asphalt by States.

Of the total deliveries by rail, 52 percent in 1949 and 55 percent in 1950 were set down in the populous area north of the Ohio and Potomac Rivers and east of the Mississippi River, although this area comprises only 14 percent of the area of continental United States. In this area terminations of asphalt were 7 percent larger in 1950 than in 1949. In the States south of the Potomac and Ohio and east of the Mississippi, deliveries of asphalt were 3 percent greater in 1950 than in 1949. Between the Mississippi River and the Rocky Mountains, railroad terminations of asphalt were 5 percent less in 1950 than in 1949; the largest decreases were in Oklahoma, Louisiana, Texas, and Minnesota. In the Rocky Mountain States receipts of asphalt by rail were nearly 16 percent lower in 1950 than in 1949. In the three Pacific States rail deliveries of asphalt were more than 20 percent lower in 1950 than in 1949.

TABLE 6.—Asphalt (natural, byproduct, and petroleum) terminated by class I railroads in the United States, 1949–50, by States, in short tons

[Interstate Commerce Commission, Freight Commodity Statistics]

Region and State	1949	1950	Region and State	1949	1950
New England	158,386	137,200	East South Central:		
Middle Atlantic:			Kentucky	131,380	128,463
New York	208,846	220,954	Tennessee	146,905	168,630
New Jersey	31,913	29,328	Alabama	70,868	52,689
Pennsylvania	529,653	608,128	Mississippi	37,041	41,504
Total	770,412	858,410	Total	386,194	391,286
East North Central:			West South Central:		
Ohio	763,144	717,118	Arkansas	55,996	73,111
Indiana	203,671	252,585	Louisiana	202,728	176,850
Illinois	497,581	556,800	Oklahoma	42,982	6,342
Michigan	228,090	239,989	Texas	112,849	83,854
Wisconsin	253,374	310,752	Total	414,555	340,157
Total	1,945,860	2,077,244	Mountain:		
West North Central:			Montana	27,893	20,591
Minnesota	235,637	223,770	Idaho	27,480	19,001
Iowa	80,973	91,064	Wyoming	6,596	3,010
Missouri	128,843	132,936	Colorado	54,541	45,746
North Dakota	49,398	49,737	New Mexico	50,780	56,278
South Dakota	61,690	56,484	Arizona	29,681	33,039
Nebraska	67,517	79,879	Utah	28,342	9,303
Kansas	90,698	103,465	Nevada	17,820	17,967
Total	714,756	737,335	Total	243,133	204,935
South Atlantic:			Pacific:		
Delaware	8,368	10,972	Washington	59,485	58,853
Maryland	13,503	13,644	Oregon	72,816	59,704
District of Columbia	940	1,438	California	266,406	198,447
Virginia	91,113	84,647	Total	398,707	317,004
West Virginia	80,383	102,707			
North Carolina	135,993	164,573	Total United States	5,584,389	5,637,478
South Carolina	82,266	51,097	Canada	9,169	3,897
Georgia	88,707	80,854			
Florida	51,113	63,975	Grand total	5,593,558	5,641,375
Total	552,386	573,907			

FOREIGN TRADE[2]

Imports.—Imports of natural asphalt and bitumen into the United States totaled 4,109 short tons valued at $87,693 in 1949 and 5,863 tons valued at $136,003 in 1950. Imports of lake asphalt from Trinidad increased fron 4,014 tons valued at $73,715 in 1949 to 4,855 tons valued at $66,953. Imports of grahamite from Cuba increased from 73 tons valued at $2,294 in 1949 to 880 tons valued at $27,880 in 1950.

Imports of solid petroleum asphalt increased from 194,911 short tons valued at $2,351,632 in 1949 to 308,959 tons valued at $3,275,967 in 1950. All of these imports in 1949 and 98 percent of those in 1950 came from the Netherlands Antilles.

In addition, the United States received 104,808 barrels (19,056 tons) of liquid petroleum asphalt valued at $263,321 in 1949 and 80,365 barrels (14,612 tons) valued at $205,031 in 1950. Nearly all of these imports, in 1949 and 1950, came from the Netherlands Antilles.

Exports.—The tonnage of natural asphalt, unmanufactured, exported from the United States increased from 16,672 short tons valued at $823,143 in 1949 to 18,817 tons valued at $931,046 in 1950. Of the

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

1950 exports, 56 percent went to Europe, notably to the United Kingdom, France, Germany, Italy, Belgium, Sweden, the Netherlands, Switzerland, and Denmark. Canada received 15 percent of the total and Mexico 3 percent.

Exports of petroleum asphalt from the United States declined from 234,456 short tons valued at $7,402,161 in 1949 to 143,229 tons valued at $4,512,043 in 1950. Decreased shipments to eastern Asia accounted principally for the decline, offsetting larger shipments to Latin America, especially to Mexico and Brazil.

TABLE 7.—Petroleum asphalt (unmanufactured) [1] exported from the United States, 1949–50, by countries of destination

[U. S. Department of Commerce]

Country	1949		1950	
	Short tons	Value	Short tons	Value
North America:				
British Honduras	342	$13,454	275	$8,598
Canada-Newfoundland	4,790	307,332	5,785	379,573
Canal Zone	2,895	39,614	4,762	77,058
Costa Rica	267	6,157	1,160	22,260
Cuba	168	6,837	1,502	46,500
Dominican Republic	237	8,469	511	17,311
El Salvador	-----	-----	2,532	39,996
Guatemala	713	20,710	11,576	205,868
Honduras	59	2,119	15	524
Mexico	9,706	261,656	25,576	614,174
Nicaragua	2,372	59,930	4,987	142,797
Panama	281	7,380	338	9,116
Other North America	107	5,288	70	2,600
Total North America	21,937	738,946	59,089	1,566,375
South America:				
Argentina	19	1,513	26	2,360
Bolivia	294	10,683	150	7,061
Brazil	10,906	413,613	23,123	1,011,964
Chile	1,112	37,034	1,174	31,452
Uruguay	2,812	80,770	3,360	122,016
Venezuela	488	20,084	385	24,592
Other South America	182	8,058	151	5,627
Total South America	15,813	571,755	28,369	1,205,072
Europe:				
Austria	13,450	406,750	1,847	43,355
Belgium-Luxembourg	2,090	142,830	2,532	96,681
Denmark	41	3,480	29	2,417
France	1,698	139,379	462	24,024
Germany	4,016	155,706	-----	-----
Greece	15,531	398,187	11,626	301,462
Italy	837	33,706	95	7,356
Netherlands	537	58,018	8	721
Norway	282	14,682	172	6,922
Spain	58	2,854	169	4,992
Sweden	75	5,612	158	12,232
Switzerland	1,065	40,576	775	32,802
Other Europe	32	1,659	9	367
Total Europe	39,712	1,403,439	17,882	533,331
Asia:				
Ceylon	2,629	63,295	19	783
French Indochina	32,165	835,504	6,311	157,356
Hong Kong	1,168	39,221	396	13,817
India-Pakistan	152	4,971	-----	-----
Indonesia	30,068	1,016,910	5,752	147,177
Israel-Jordan	2	219	3,199	84,538
Japan	22,509	593,045	66	3,442
Korea	12,149	402,754	-----	-----
Lebanon	1,136	38,773	166	5,442
Malaya, Federation of	2,150	68,609	24	315
Philippines	23,348	679,380	1,827	46,789

For footnote, see end of table.

TABLE 7.—Petroleum asphalt (unmanufactured) [1] exported from the United States, 1949–50, by countries of destination—Continued

U. S. Department of Commerce]

Country	1949		1950	
	Short tons	Value	Short tons	Value
Asia—Continued				
Saudi Arabia	6	$237	65	$4,263
Thailand	1,376	29,916		
Turkey	3,438	95,855	7,809	303,458
Other Asia	30	1,759	30	1,353
Total Asia	132,326	3,870,448	25,664	768,733
Africa:				
Algeria	743	65,758		
Belgian Congo	2,266	82,112	1,640	57,719
Ethiopia	1,935	72,139		
French Morocco	178	15,481	592	49,995
French West Africa	3,929	111,251	764	30,352
Mozambique	1,851	39,451	2,922	74,700
Tunisia	267	23,969	248	20,533
Union of South Africa	10,591	306,122	5,070	168,969
Other Africa	1,556	51,454	591	20,485
Total Africa	23,316	767,737	11,827	422,753
Oceania:				
Australia	930	38,101	166	7,311
New Zealand	38	1,568	43	1,421
French Pacific	384	10,168	189	7,047
Total Oceania	1,352	49,837	398	15,779
Grand Total	234,456	7,402,162	143,229	4,512,043

[1] In addition, exports of "petroleum-asphalt manufactures" were valued as follows: 1949—$321,252; 1950—$381,019 (quantity not available).

ROAD OIL

Sales of road oil by petroleum refineries in the United States increased 8 percent in quantity—from 6,768,000 barrels in 1949 to 7,326,000 barrels in 1950—but, because of lower prices, declined 4 percent in value—from $17,485,000 in 1949 to $16,876,000 in 1950. The increase in quantity was due principally to greater sales in the Indiana-Illinois-Kentucky, etc. district, the Rocky Mountain district, the California district, and the Texas district. Four refining districts—Indiana-Illinois-Kentucky, etc., Oklahoma-Kansas-Missouri, Rocky Mountain, and California—together made 97 percent of all the road-oil sales in 1949 and 96 percent in 1950.

Of the total sales of road oil to domestic consumers, 97,207 barrels valued at $397,074 in 1949 and 71,291 barrels valued at $233,269 in 1950 were made from foreign petroleum, imported chiefly from Venezuela, Colombia, and Mexico.

TABLE 8.—Supply and disposition of road oil in the United States in 1950, by refinery districts, in thousands of barrels

District	Production	Receipts [1]	Stocks Jan. 1	Stocks Dec. 31	Consumption by producers, transfers, losses, and exports	Sales to domestic consumers
East Coast	131	58	10	10	106	83
Appalachian						
Indiana, Illinois, Kentucky, etc	1,397	148	35	26	49	1,505
Oklahoma, Kansas, Missouri	834	424	10	72	45	1,151
Texas	71	152	1	1	1	222
Louisiana-Arkansas	13	8	5	3	15	8
Rocky Mountain	1,838	410	101	99	730	1,520
California	2,644	193	204	186	18	2,837
Total: 1950	6,928	1,393	366	397	964	7,326
1949	7,691	1,075	501	366	2,133	6,768

[1] Receipts from intraindustry refinery transfers, imports, and transfers from stocks formerly not classed as road oil.

TABLE 9.—Road oil sold by petroleum refineries to domestic consumers in the United States 1949–50, by refinery districts

District	1949		1950	
	Thousand barrels	Thousand dollars	Thousand barrels	Thousand dollars
East Coast	106	432	83	267
Appalachian	12	36		
Indiana, Illinois, Kentucky, etc	1,336	3,555	1,505	4,075
Oklahoma, Kansas, Missouri	1,129	2,828	1,151	2,480
Texas	99	313	222	507
Louisiana-Arkansas	6	18	8	21
Rocky Mountain	1,374	3,492	1,520	3,383
California	2,706	6,811	2,837	6,143
Total	6,768	17,485	7,326	16,876

Barite

By Joseph C. Arundale and F. M. Barsigian

GENERAL SUMMARY

DOMESTIC production of barite declined in 1950, but the United States remained the world's leading producer. Arkansas continued to be the leading producing State, supplying nearly half of the total. One producer in California and two in Tennessee reported discontinuation of operations. New production was reported from New Mexico, and a new grinder began operations in Missouri. There were reported shortages of barite, particularly for well-drilling use, and many consumers drew from stocks. There was a sharp increase in imports and consumption of lithopone. Imports of crude barite were nearly double those of the previous year; most of the increased tonnages came from operations in Nova Scotia. Interest continued in the barium titanates and titanate ceramic materials. Several articles reviewing the barite industry in foreign countries were published.

TABLE 1.—Salient statistics of the barite and barium-chemical industries in the United States, 1946–50

	1946	1947	1948	1949	1950
Barite:					
Primary:					
Produced short tons	725,223	884,219	777,841	731,308	693,424
Sold or used by producers:					
Short tons	724,362	834,082	799,848	717,313	695,414
Value	$5,242,755	$6,171,342	$6,693,413	$5,642,226	$6,193,906
Imports for consumption:					
Short tons	44,662	53,222	53,204	26,178	58,381
Value	[1] $271,565	$378,294	$443,515	$192,567	$431,879
Consumption short tons	722,073	835,818	894,309	719,543	786,131
Ground and crushed sold by producers:					
Short tons	455,240	549,965	631,424	554,028	573,359
Value	$7,208,193	$8,979,400	$11,195,365	$10,156,590	$11,305,209
Barium chemicals sold by producers:					
Short tons	80,871	72,919	71,717	[1] 57,012	73,689
Value	$7,003,756	$7,035,104	$7,028,058	$5,646,403	$7,885,586
Lithopone sold or used by producers:					
Short tons	147,001	165,024	140,033	78,335	105,650
Value	$11,840,596	$17,382,592	$16,135,976	$8,977,178	$13,129,363

[1] Revised figure.

DOMESTIC PRODUCTION

Domestic producers reported production of 693,424 short tons of primary barite during 1950.[1] This was the smallest output since 1945; however, the United States continued to lead the world in barite production.

[1] The term "primary barite," as used in this chapter, applies to barite as first offered to the trade, whether lump, crushed, or ground. Where ground barite has been reported to the Bureau of Mines as original production, an estimate of the value of the lump equivalent of the ground has been assigned to such tonnage.

In 1950 Arkansas was still the leading producer by a large margin, although output from the State decreased; Missouri was second, and Georgia moved up to third place.

Although the available supply (production plus imports) of barite was slightly less than in the previous year, the demand was stronger, and many consumers were forced to draw from stocks. Decreases in output in Arkansas, Nevada, California, Idaho, and Tennessee were partly offset by increases from Georgia, South Carolina, and Missouri.

TABLE 2.—Domestic barite sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Arkansas [1]	362,470	$2,899,760	363,382	$2,907,056	343,168	$3,088,512
Georgia	62,781	654,959	50,267	465,325		
South Carolina	----------	----------	([2])	([2])	72,888	766,711
Tennessee	25,818	275,242	13,376	137,120		
Missouri	278,071	2,413,802	186,891	1,497,985	212,736	1,924,520
Nevada	([2])	([2])	70,576	416,416	47,608	268,874
Other States [3]	70,708	449,650	32,821	218,324	19,014	145,289
Total	799,848	6,693,413	717,313	5,642,226	695,414	6,193,906

[1] Value estimated.
[2] Included with "Other States."
[3] 1948—Arizona, California, and Nevada; 1949—Arizona, California, Idaho, New Mexico, and South Carolina; 1950—Arizona, California, Idaho, and New Mexico.

TABLE 3.—Ground (and crushed) barite produced and sold by producers in the United States, 1946–50

Year	Plants	Production (short tons)	Sales	
			Short tons	Value
1946	23	456,327	455,240	$7,208,193
1947	23	552,227	549,965	8,979,400
1948	23	630,808	631,424	11,195,365
1949	24	561,258	554,028	10,156,590
1950	26	569,129	573,359	11,305,209

Arizona.—The Arizona Barite Co. continued to produce ground barite for the well-drilling trade at its mine and mill near Mesa.

Arkansas.—Magnet Cove Barium Corp., which had been in continuous operation since 1941, was sold to Dresser Industries, Inc., of Cleveland, Ohio. The firm took over operation of the barite mine at Magnet Cove and the plant at Malvern. Baroid Sales Division of National Lead Co., in continuous production since 1942, produced ground barite at Malvern. All production from Arkansas was consumed in well drilling.

California.—Baroid Sales Division of National Lead Co. reported that its El Portal mine near El Portal was shut down during the year; however, the firm is reported to be developing a new deposit disclosed by drilling in this area.[2] Barium Products, Ltd., crushed barite in its plant at Modesto, the crude barite coming from its Almanor mine

[2] Mining Congress Journal, vol. 36, No. 12, December 1950, p. 71. Mining Record, vol. 61, No. 39, Sept. 21, 1950, p. 5.

near Greenville and two mines in Nevada. The crushed product was used in chemicals and glass.

Georgia.—New Riverside Ochre Co. and Paga Mining Co. produced barite near Cartersville. Several smaller producers also operated in Georgia during the year.

A report on barite in the Cartersville district, Georgia, gave cumulative output of barite concentrates from this district through 1943 as 1,830,000 long tons, about 24 percent of the total production of the United States.[3]

Idaho.—Simplot Fertilizer Co. ground barite in its plant at Pocatello for well-drilling use.

Missouri.—Numerous operators produced barite during the year, and the total output from the State increased over that in the previous year. The Superbar Co. completed a new grinding plant near Mineral Point and began grinding purchased Missouri crude barite.

Nevada.—Production in Nevada decreased, but a number of producers still operated.

New Mexico.—Mudrite Chemical Corp. resumed production near Hatch. A new firm—the Mex Tex Mining Co.—started production from its mine near Bingham and new mill at San Antonio. Its daily capacity is expected to be 200 tons per day.

South Carolina.—Industrial Minerals, Inc., continued to produce barite at Kings Creek. This company reported that it had begun open-pit mining and intended to abandon underground operations.

Tennessee.—Production in Tennessee continued to decline as two producers discontinued operations in 1950, leaving only B. C. Wood and L. A. Wood producing barite near Sweetwater.

CONSUMPTION AND USES

The bulk of the barite consumed was used in well-drilling muds, barium chemicals, and lithopone, with minor quantities consumed in glass, paint, rubber, and other products. Over half of all the domestic barite consumed and some imported material went into drilling muds as a weighting agent. The industry reported a shortage during the year. An increasing number of oil and gas wells are being drilled to greater average depths each year. In 1950, 43,279 wells were drilled to an average depth of 3,680 feet.

Consumption of barite in lithopone during the year was greater than in 1949 but well below that in previous years. This is explained by the fact that, although the demand for most pigments was at a record high, titanium dioxide pigments are replacing lithopone to some extent. At present, substitution is limited by titania plant capacity.

A considerable quantity of barite was consumed in a relatively new use during the year—aggregate in concrete for coating and weighting oil and gas pipelines in river crossings and swampy conditions, for protecting the pipe from corrosion, and for other concrete work where a heavy or dense aggregate is desirable.[4]

Use of free-flowing carbonate may decrease requirements of barium carbonate by 25 percent in scum prevention.[5]

[3] Kesler, T. L., Geology and Mineral Deposits of the Cartersville District, Ga.: U. S. Geol. Survey Prof. Paper 224, May 1950, pp. 1–97.
[4] Engineering and Mining Journal, vol. 152, No. 2, February 1951, p. 101.
[5] Brick and Clay Record, vol. 116, No. 4, April 1950, p. 99.

Two barium chemical plants damaged by fire in 1949 completed repairs and were put into operation. These were Barium & Chemicals, Inc., Willoughby, Ohio,[6] and Chemical Products Corp., Cartersville, Ga., which also was undergoing a modernization program.[7]

TABLE 4.—Crude barite (domestic and imported) used in the manufacture of ground barite and barium chemicals in the United States, 1945–50, in short tons

Year	In manufacture of—			Total	Year	In manufacture of—			Tota
	Ground barite [1]	Litho-pone	Barium chemicals			Ground barite [1]	Litho-pone	Barium chemicals	
1945	482, 442	139, 288	99, 173	720, 903	1948	640. 284	153, 987	100, 038	894, 309
1946	465, 468	154. 166	102, 439	722, 073	1949	567, 249	71, 710	80, 584	719, 543
1947	561, 230	167, 321	107, 267	835, 818	1950	578, 078	99, 703	[2] 108, 350	786, 131

[1] Includes some crushed barite. [2] Includes small quantity of witherite.

TABLE 5.—Ground (and crushed) barite sold by producers, 1948–50, by consuming industries

Industry	1948		1949		1950	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Well drilling	565, 249	90	494, 579	89	483, 519	84
Glass	23, 580	4	21, 768	4	24, 638	4
Paint	22, 000	3	20, 000	4	28, 000	5
Rubber	18, 000	3	14, 000	2	19, 000	3
Concrete aggregates					15, 784	3
Undistributed	2, 595	(1)	3, 681	1	2, 418	1
Total	631, 424	100	554, 028	100	573, 359	100

[1] Less than 0.5 percent.

TABLE 6.—Lithopone sold or used by producers in the United States, 1946–50

	1946	1947	1948	1949	1950
Plants	8	8	8	8	7
Short tons	147, 001	165, 024	140, 033	78, 335	105, 650
Value	$11, 840, 596	$17, 382, 592	$16, 135, 976	$8, 977, 178	$13, 129, 363

TABLE 7.—Distribution of lithopone shipments, by industries, 1948–50, in short tons

Industry	1948		1949		1950	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Paints, varnishes, and lacquers [1]	104, 441	75	56, 146	72	78, 177	74
Floor coverings	12, 423	9	6, 380	8	5, 297	5
Coated fabrics and textiles	8, 436	6	6, 602	8	7, 945	8
Paper	4, 814	3	2, 375	3	2, 290	2
Rubber	4, 192	3	3, 245	4	4, 092	4
Other	5, 727	4	3, 587	5	7, 849	7
Total	140, 033	100	78, 335	100	105, 650	100

[1] Includes a quantity, not separable, used for printing ink, except for 1950.

[6] Chemical Engineering, vol. 57, No. 4, April 1950, p. 210.
[7] Chemical Engineering, vol. 57, No. 1, January 1950, p. 182.

TABLE 8.—Barium chemicals produced and used or sold by producers in the United States, 1946–50, in short tons

Chemical	Plants	Produced	Used by producers [1] in other barium chemicals [2]	Sold by producers [3]	
				Short tons	Value
Black ash: [4]					
1946	15	163,131	162,889	505	$22,876
1947	15	173,385	172,987	248	15,888
1948	16	152,383	151,509	459	31,442
1949	15	97,693	97,753	246	16,464
1950	12	130,967	130,305	499	33,084
Carbonate (synthetic):					
1946	5	43,611	21,569	21,700	1,313,233
1947	5	46,761	20,767	25,985	1,739,144
1948	5	43,227	16,588	27,482	1,927,599
1949	4	36,122	10,077	27,010	1,942,845
1950	4	49,299	13,063	36,266	2,746,628
Chloride (100 percent $BaCl_2$):					
1946	3	[5] 15,155	[5] 4,092	10,821	927,155
1947	4	[5] 13,444	[5] 3,135	9,867	986,958
1948	4	[5] 13,008	[5] 3,534	8,998	964,311
1949	3	[5] 10,513	[5] 2,872	[5] 7,679	848,637
1950	3	12,285	3,324	8,874	992,722
Hydroxide:					
1946	3	3,024	585	2,503	320,474
1947	4	5,774	568	4,910	787,711
1948	4	5,030	92	4,849	809,589
1949	4	3,849	140	3,737	694,097
1950	4	7,927	82	7,888	1,540,046
Oxide:					
1946	3	6,507	6,105	375	64,522
1947	3	7,318	6,865	378	74,320
1948	3	7,247	6,449	577	127,716
1949	3	5,795	4,899	1,118	233,733
1950	3	8,129	6,021	2,162	451,277
Sulfate (synthetic):					
1946	8	34,171	16,956	18,791	1,330,651
1947	8	27,353	10,980	16,086	1,302,869
1948	7	22,733	(6)	17,134	1,601,497
1949	7	15,182		15,371	1,436,557
1950	6	15,821		15,676	1,505,628
Other barium chemicals: [7]					
1946	(8)	28,880	4,395	26,176	3,024,845
1947	(8)	21,107	4,092	15,445	2,128,214
1948	(8)	13,469	[5] [9] 8,994	12,218	1,565,904
1949	(8)	5,320	2,890	[5] 1,851	474,070
1950	(8)	5,049	2,878	2,324	616,201
Total: [10]					
1946	19			80,871	7,003,756
1947	20			72,919	7,035,104
1948	20			71,717	7,028,058
1949	20			[5] 57,012	5,646,403
1950	17			73,689	7,885,586

[1] Of any barium chemical.
[2] Includes purchased material.
[3] Exclusive of purchased material and exclusive of sales by one producer to another.
[4] Black-ash data include lithopone plants.
[5] Revised figure.
[6] Included with "Other barium chemicals."
[7] Consists mostly of titanium dioxide-barium sulfate pigments (except in 1949–50), with small quantities of barium acetate, chromate, nitrate, perchlorate, peroxide, and sulfide. Specific chemicals may not be revealed by specific years.
[8] Plants included in above figures.
[9] Also includes barium sulfate (synthetic).
[10] A plant producing more than 1 product is counted but once in arriving at grand totals.

PRICES

Trade journals quoted moderate price increases for certain types of barite during the year.

Crude.—E&MJ Metal and Mineral Markets quoted the following prices for crude barite, f. o. b. mines: In September, Georgia, jig and lump, was increased to $13.00–$13.50 per long ton; Missouri, minimum 94 percent $BaSO_4$, less than 1 percent iron, continued at $9.50; 93 percent $BaSO_4$, $9.25.

Ground.—The December 18, 1950, issue of the Oil, Paint and Drug Reporter quoted water-ground barite in paper bags, carlots, St. Louis, $37.60–$37.85 per short ton, an increase over the January quoted price of $35.05. In December the price of Georgia, beneficiated barite in paper bags was $16–$18 per short ton, according to E&MJ Metal and Mineral Markets. Well-drilling grades of ground barite average $18.85 a short ton, bulk, f. o. b. plant, according to reports of grinders to the Bureau of Mines.

Witherite.—Witherite (barium carbonate) was quoted in 1950 at $65 per short ton, air-floated, carlots (the same as in 1949); $72 on less than 1 carload.

TABLE 9.—Range of quotations on barium chemicals in 1950

[Oil, Paint and Drug Reporter]

Barium carbonate, precipitated, bags, 10 tons and up, works	short ton	$72.50 -$87.50
Barium chlorate, kegs, works	pound	.25½- .35
Barium chloride, technical, bags, carlots, works, freight equaled	short ton	90.00 -156.00
Barium chromate, bags, freight equaled	pound	.31½- .32
Barium dioxide (peroxide), drums, carlots, works	do	.12
Barium hydrate, crystals, bags	do	.09 - .09½
Barium nitrate, barrels, carlots, works	do	.11½
Barium oxide, ground, drums, carlots, works	do	.11
Blanc fixe (dry):		
Direct process, bags, carlots, works	short ton	85.00 - 90.00
Byproduct, bags, carlots, works	do	80.00 - 85.00
Lithopone:[1]		
Ordinary, bags, carlots, delivered	pound	.06¼- .07½
Less carlots, same basis	do	.06½- .08½
Titanated (high-strength), bags, carlots, delivered	do	.08¼- .09⅝
Smaller lots	do	.08½- .10⅝

[1] Pacific coast prices on lithopone ¾ cent to 1 cent per pound higher.

FOREIGN TRADE[8]

Barite.—Imports of crude barite were the greatest since 1944 and more than double the 1949 quantity. The bulk of the imported crude barite came from Nova Scotia, with lesser quantities from Mexico and Yugoslavia.

TABLE 10.—Barite imported for consumption in the United States, 1946–50, by countries

[U. S. Department of Commerce]

	1946		1947		1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Crude barite:										
Algeria									(1)	$2
Canada	44,109	$268,839	48,364	$355,349	39,877	$359,161	8,813	$60,429	44,501	328,689
Italy			2	40	5,601	51,257	5,712	65,024		
Mexico	553	[2] 2,726	4,856	22,905	7,726	33,097	3,589	9,516	3,296	4,213
Yugoslavia							8,064	57,598	10,584	98,975
Total crude barite	44,662	[2] 271,565	53,222	378,294	53,204	443,515	26,178	192,567	58,381	431,879
Ground barite:										
Greece					(1)	11	211	2,241	478	5,363
Italy									200	4,535
Total ground barite					(1)	11	211	2,241	678	9,898

[1] Less than 0.5 ton. [2] Revised figure.

[8] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Barite was on the list of commodities discussed at the third round of the General Agreement on Tariffs and Trade held at Torquay, England, in September 1950. The Committee on Reciprocity Information held a hearing on the subject earlier in the year.

Witherite.—No witherite is being produced currently in the United States except as an "impurity" in barite. All imports of witherite came from Great Britain.

TABLE 11.—Witherite, crude, unground, imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons	Value [1]	Year	Short tons	Value [1]
1945	896	$26,736	1948	2,470	$94,809
1946	1,107	31,599	1949	2,113	63,369
1947	739	25,757	1950	2,089	51,381

[1] Valued at port of shipment.

Barium Chemicals.—Imports of lithopone increased a hundred-fold in 1950 over 1949, whereas exports continued to decline.

TABLE 12.—Barium chemicals imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Lithopone		Blanc fixe (precipitated barium sulfate)		Barium chloride	
	Pounds	Value	Short tons	Value	Pounds	Value
1946	1,000	$58				
1947	112	21				
1948						
1949	24,003	2,053	1	$54	8	$8
1950	2,402,572	179,197	53	6,174		

Year	Barium nitrate		Barium carbonate precipitated		Other barium compounds	
	Short tons	Value	Short tons	Value	Short tons	Value
1946						
1947	66	$9,511			6	$1,916
1948	141	17,492			11	3,771
1949	84	7,819			11	5,651
1950	149	21,083	286	$28,222	35	11,669

TABLE 13.—Lithopone exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1945	11,576	$1,049,961	$90.70	1948	21,015	$2,972,912	$141.47
1946	9,651	888,555	92.07	1949	14,460	1,918,913	132.70
1947	13,652	1,784,414	130.71	1950	9,357	1,248,538	133.43

TECHNOLOGY

There was continued interest in the compound barium titanate, particularly with regard to its possible use in equipment producing high-intensity sound. Such equipment may be used in washing clothing, mixing paints, etc.[9]

An interesting article on titanate ceramics was published. This article described the properties of these titanates, barium titanate in particular, the research and development work being done, and their potential usefulness in producing ultrasonic waves in liquids.[10]

A new colloidal barium compound mixture has been developed, which is said to produce clearer X-rays of the stomach and intestinal tract.[11]

WORLD REVIEW

Austria.—Barite production rose rapidly during the postwar period after World War II and by 1947 was more than double that of 1937. By 1949 it was over nine times that of 1937. The bulk of the production in 1950 was from the French Zone, with smaller quantities from the Soviet Zone.

At the same time that Austrian output increased in the postwar years consumption also has increased. No barite is exported, and considerable quantities are imported, mostly from Yugoslavia, Italy, and Germany.

There are known deposits of barite in the French and Soviet Zones. The Grosskogel is an underground mine in the Tirol in the French Zone; the Erzkogel is an open-pit mine in lower Austria in the Soviet Zone; and a third mine at the Kirtzbuehler Horn in the Tirol (French Zone) is still in the exploration stage. The barite mined in Austria is sold in lumps, crushed and unbleached. The price in 1950 was 250 schillings (about $12 at the official exchange rate) per metric ton.[12]

Canada (Nova Scotia).—A report on the condition of the Canadian barite industry was published.[13]

Maritime-Barytes, Ltd., is reported to have arranged financing for mill construction, and preliminary work was under way at the property near Brookfield, Nova Scotia. Officials anticipate that the 40- to 65-ton plant for producing high-grade white filler barite, with oil-well grade barite as a byproduct, would be ready to operate next April. The plant, designed by General Engineering Co. of Toronto, introduces some new features to the barite-milling procedure that are expected to result in improved recovery and more economical operation.[14]

Germany.—Before World War II Germany produced nearly half the world's supply of barite. In the postwar years much smaller quantities have been produced, which are adequate for her own use, with surplus for export to Switzerland, Indonesia, Netherlands, Czechoslovakia, and Belgium. Barite is obtained from deposits in

[9] *Sound Progress* (Industrial Bulletin of Arthur D. Little, Inc.), July 1950, No. 267.
[10] Jaffe, Hans, Titanate Ceramics for Electromechanical Purposes: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 264–68.
[11] Chemical and Engineering News, vol. 28, No. 37, Sept. 11, 1950, p. 3130.
[12] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, pp. 32–33.
[13] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 4, October 1950, pp. 30–32.
[14] Northern Miner (Toronto), vol. 36, No. 37, Dec. 7, 1950, p. 25.

TABLE 14.—World production of barite, by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Algeria	2,770	14,240	23,692	16,681	16,874	19,890
Argentina	8,585	10,000	[2] 35,000	(3)	(3)	(3)
Australia	3,502	7,711	5,500	3,831	5,552	[2] 6,000
Austria	(3)	816	1,932	3,672	8,004	10,800
Brazil	617	10,326	13,971	[2] 10,000	6,010	(3)
Canada	126,632	109,242	116,731	86,860	42,763	53,522
Chile	3,097	3,752	2,546	2,141	1,461	(3)
Colombia	(3)	(3)	[2] 2,800	120	(3)	(3)
Cuba (exports)	2,094	----------	----------	----------	----------	(3)
Egypt	54	----------	167	----------	30	(3)
France	13,795	34,570	53,970	47,951	32,833	(3)
French Morocco	----------	----------	----------	----------	----------	4,910
Germany:						
Federal Republic } Soviet Zone }	(3)	[4] 45,736	[5] 35,000	[5] 41,000	} 183,457	(3)
Soviet Zone			(3)	(3)		
Greece	----------	----------	[2] 20,000	18,706	15,604	20,799
India	25,051	29,558	24,700	22,691	21,487	(3)
Ireland	16,714	13,557	12,927	7,035	(3)	(3)
Israel and Jordan	23	3	(3)	(3)	(3)	(3)
Italy	11,935	32,132	68,736	62,234	46,616	48,142
Japan	[6] 7,540	581	907	3,404	9,322	14,239
Korea:						
Northern } Southern }	----------	[2] 100	[2] 1,000	(3)	(3)	(3)
Southern			----------	----------	(3)	(3)
Leeward Islands: Antigua	363	52	14	----------	(3)	(3)
Peru	4,240	7,187	6,560	1,787	(3)	(3)
Portugal	290	294	1,211	406	(3)	(3)
South-West Africa	----------	----------	----------	----------	48	----------
Southern Rhodesia	----------	173	18	51	488	261
Spain	9,877	12,245	19,817	14,153	7,665	(3)
Swaziland	79	224	172	98	104	441
Sweden	1,250	505	1,319	1,914	(3)	(3)
Tunisia	68	408	470	230	630	25
Union of South Africa	2,222	2,326	2,672	1,734	2,222	2,268
United Kingdom [7]	94,711	112,705	96,267	(3)	(3)	(3)
United States	628,068	657,908	802,146	705,642	663,428	629,060
Total [8]	1,165,000	1,155,000	1,395,000	1,320,000	1,255,000	1,210,000

[1] In addition to countries listed, barite is produced in Belgium, China, Czechoslovakia, Mexico, Norway, Pakistan, Switzerland, U. S. S. R., and Yugoslavia, but data on production are not available.
[2] Estimate.
[3] Data not available; estimate by author of chapter included in total.
[4] Excludes British zone.
[5] United States zone.
[6] Preliminary data for the fiscal year ended March 31 of year following that stated.
[7] Includes witherite.
[8] Estimated by author of chapter; excludes countries listed in footnote 1.

the Southern Harz Mountains at Richelsdorf, in Lower Hesse, in the Spessart area, and in the Black Forest. It is also obtained as a coproduct at a pyrite mine.[15]

Great Britain.—The barite reserves of Great Britain were surveyed in an article. Reserves of proved and probable ore in mines now operating in England and Wales are estimated to exceed 2 million tons. The report also states that barite in economic quantities has been found in the northern Pennines, Durham coal field, Devonshire, the Lake District, Derbyshire, Shropshire, north and central Wales, and Somerset. Precipitated barium sulfate is also recovered from the mine waters of the Backworth colliery, northeast of Newcastle-on-Tyne. Proved and probable reserves of about 160,000 tons are estimated for the two principal Scottish mines.[16]

[15] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 3, September 1950, p. 28.
[16] Mining and Engineering Journal, vol. 60, part 2, No. 2971, Jan. 21, 1950, p. 703.

The Muirshiel mine, near the village of Loch Winnoch in Renfrewshire, Scotland, is one of the largest producers of barite in the United Kingdom. A description of the deposit, a history of its operation, and an account of the present production methods were presented in an article.[17]

Greece.—Barite produced in Greece is marketed in the United Kingdom and Trinidad, with smaller quantities going to Saudi Arabia, Iraq, and Lebanon.[18]

---

[17] Mining Journal (London), Modernization of Scotland's Oldest Barytes Mine: Vol. 235, No. 5999, Aug. 11,1950, pp. 134–135.

[18] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, p. 34.

Bauxite

By Horace F. Kurtz and D. D. Blue

GENERAL SUMMARY

BAUXITE supplies met the requirements of most consuming industries during 1950, although the general production and processing capacity became more critical than at any time since World War II. Large quantities of bauxite were absorbed by the National Stockpile, and increased aluminum production required more bauxite than in other postwar years. The aluminum expansion program, as planned at the end of 1950, foretold an increase of over 50 percent in the requirements of metallurgical bauxite by 1953. Similarly, bauxite consumption by the abrasive, chemical, and other industries was greater in 1950, and further increases were expected to meet defense requirements. The unique increase in consumption of bauxite by the refractory industry reflected a gradual change from diaspore to bauxite as a source of aluminous material. As a result of the outlook for future requirements of bauxite, one Canadian and two domestic aluminum producers accelerated their schedules for developing bauxite deposits in Jamaica, and further expansion was planned in both Surinam and Arkansas in 1950.

TABLE 1.—Salient statistics of the bauxite industry in the United States, 1941–45 (average), and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Crude ore production (dried equivalent)........long tons..	2,715,340	1,104,054	1,202,055	1,457,148	1,148,792	1,334,527
Imports (as shipped)....do....	969,732	852,005	1,821,580	2,488,915	2,688,164	2,476,677
Exports (as shipped)....do....	217,049	97,788	94,369	54,113	[1] 34,902	45,209
World production.........do....	7,644,000	4,307,000	6,216,000	8,083,000	8,169,000	8,205,000

The demand for bauxite in 1950 was met largely by increased domestic production and by imports from South America and Indonesia. Domestic output totaled 1,334,527 tons (dried equivalent), 35 percent of the total new supply. The supply was augmented by a reduction of stocks in the hands of consumers and withdrawal of bauxite from the Government-held low-grade stockpiles at Hurricane Creek, Ark.

Prices of bauxite in most forms were higher in 1950 than in 1949, but an increase in the quantity of low-grade domestic bauxite mined caused a slight reduction in the average price as shipped to consumers. The value of production was computed as $7,692,809.

World production was estimated at 8,205,000 long tons, compared with 8,169,000 tons (revised) in 1949. United States and the Guianas, principal producers in the Western Hemisphere, mined 61 percent of the 1950 total, about the same proportion as in the preceding year.

Aluminum metal and aluminum oxide abrasives are discussed in the Aluminum and Abrasive Materials chapters, respectively, of this volume.

232294—53——12

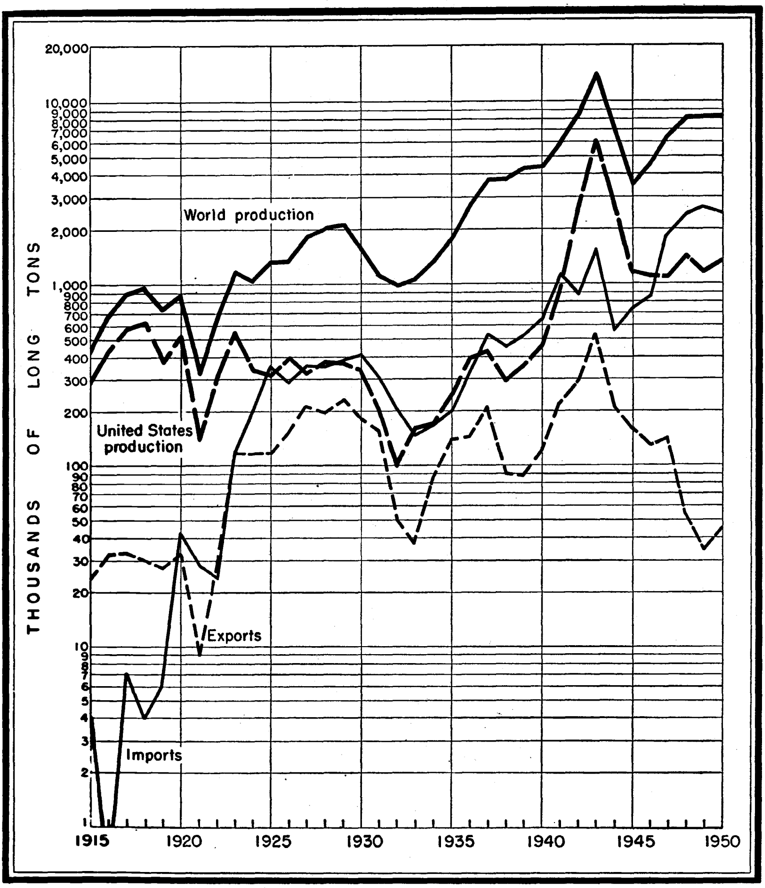

FIGURE 1.—Domestic production, imports, exports, and world production of bauxite, 1915–50.

RESERVES

Based on information obtained from drilling by the Bureau of Mines and information supplied by the bauxite-mining companies, the reserves of bauxite in Arkansas containing plus 32 percent available alumina were estimated in 1944 at 49,350,000 long tons in place. Assuming that the average moisture content is 15 percent, that 85 percent of the ore can be mined by open-pit methods with a 15-percent mining loss, and that 15 percent must be mined by underground methods with a 40-percent mining loss, the estimated reserves are equivalent to about 34,000,000 long tons after mining and drying. The "percent available alumina" was determined by subtracting 1.1 times the percentage of SiO_2 from the percentage of Al_2O_3. This is approximately the amount of alumina that would be recovered by the standard Bayer process.[1] More recent data developed by the

[1] Malamphy, M. C., Dale, G. K., Romslo, T. M., Reed, A. H., Jr., Ollar, A., and Tracey, J. I., Jr., Investigation of Arkansas Bauxite. Volume 1: Bureau of Mines Rept. of Investigations 4251, 1948, pp. 5, 9, and 10.

U. S. Geological Survey showed reserves of Arkansas bauxite at 38,900,000 tons in the ground (wet basis). This estimate included all measured, indicated, and inferred reserves in deposits 8 feet or more thick, containing not more than 15 percent silica or 6 percent ferrous iron and not less than 40 percent alumina and 32 percent available alumina. A typical analysis of the bauxite included in the estimate was given as: 52 percent Al_2O_3, 10 percent SiO_2, and 8 percent Fe_2O_3.[2]

Bauxite reserves in the Southeastern States, chiefly Alabama and Georgia, were estimated at 1,739,000 long tons in place, as of 1944. All bauxite measured, indicated, and inferred included in this estimate was in deposits 5 feet or more thick, containing not more than 15 percent silica and not less than 40 percent total alumina and 32 percent available alumina, with no restriction on iron content. A typical analysis of this ore showed 56 percent Al_2O_3, 13 percent SiO_2, and 1 percent Fe_2O_3.[3] More recent data on new discoveries and descriptions of deposits in various districts of the Southeastern States have been published since this estimate.[4]

In addition to reserves in the areas mentioned Oregon is known to have large deposits of high-iron bauxite.[5] Bauxitic clays, kaolin, alunite, anorthosite, and other aluminum silicates are widespread in the United States, and development of beneficiation and extractive processes that would make their treatment more economical would greatly increase the usable reserves of aluminous ore.[6] One method, used by Germany in World War II, for desilicating these materials was investigated by the Bureau of Mines.[7]

DOMESTIC PRODUCTION

In response to the demand for bauxite for the rearmament program, especially for expanding aluminum production, the domestic output of bauxite increased 17 percent to 1,584,753 long tons (1,334,527 tons, dried equivalent) from 1949 to 1950. Production from mines in Arkansas gained 21 percent over 1949, although Alabama and Georgia declined 43 and 54 percent, respectively. Arkansas supplied approximately 98 percent of the Nation's 1950 total.

---

[2] Gordon, Mackenzie, Jr., Tracey, J. I., Jr., and Ellis, M. M., The Arkansas Bauxite Deposits: U. S. Geol. Survey Prof. Paper (in prep.).

[3] U. S. Senate, Investigations of Natural Resources Hearings Before a Subcommittee of the Committee on Public Lands: U. S. 80th Cong., 1st sess., 1947, p. 223.

[4] Coulter, Don M., Margerum Bauxite District, Colbert County, Ala.: Bureau of Mines Rept. of Investigations 4207, 1948, 10 pp. Bauxite in Cherokee and Calhoun Counties, Ala.: Bureau of Mines Rept. of Investigations 4223, 1948, 28 pp. Bauxite Deposits in Union and Pontotoc Counties, Miss.: Bureau of Mines Rept. of Investigations 4235, 1948, 8 pp.

Reed, Donald F., Bauxite Deposits in Tippah and Benton Counties, Miss.: Bureau of Mines Rept. of Investigations 4281, 1948, 15 pp.

Beck, William A., Investigation of the Irwinton Bauxite District, Wilkinson County, Ga.: Bureau of Mines Rept. of Investigations 4495, 1949, 16 pp. Investigation of the Andersonville Bauxite District, Sumter, Macon, and Schley Counties, Ga.: Bureau of Mines Rept. of Investigations 4538, 1949, 150 pp. Investigation of the Springvale Bauxite District, Randolph County, Ga.: Bureau of Mines Rept. of Investigations 4555, 1949, 20 pp.

Allen, S. A., Bauxite Investigations, Eufaula District, Barbour and Henry Counties, Ala.: Bureau of Mines Rept. of Investigations 4521, 1949, 85 pp.

McIntosh, Frank K., Investigation of Hamilton County Bauxite District, Tenn.: Bureau of Mines Rept. of Investigations 4550, 1949, 31 pp.

Lewiecki, Walter T., Investigation of the Hermitage Bauxite District, Bartow and Floyd Counties, Ga.: Bureau of Mines Rept. of Investigations 4577, 1949, 10 pp.

[5] Libbey, F. W., Lowry, W. D., and Mason, R. S., Ferruginous Bauxite Deposits in Northwestern Oregon: Oregon Dept. of Geol. and Min. Ind., Bull. 29, 1945, 97 pp.

[6] Kershner, K. K., Funk, C. W., and Calhoun, W. A., Low-Grade Bauxites and Clays as Potential Aluminum Resources: Preprint, Am. Inst. Min. and Met. Eng. Paper 280-D, 1950, 11 pp.

[7] Skow, Milford L., and Conley, John E., Laboratory Tests on Percolation Leaching of Silica from Bauxites: Bureau of Mines Rept. of Investigations 4649, 1950, 16 pp.

TABLE 2.—Production of bauxite in the United States by quarter years,[1] 1947–50, in long tons

[Dried-bauxite equivalent]

Months	1947	1948	1949	1950
January–March	323,180	295,488	320,157	322,006
April–June	301,561	359,284	294,023	368,256
July–September	282,665	437,457	208,926	293,724
October–December	294,649	364,919	325,686	350,541
Total	1,202,055	1,457,148	1,148,792	1,334,527

[1] Figures adjusted to final annual totals.

Alabama.—All of the Alabama bauxite output in 1950 was produced by the Alcoa Mining Co. and D. M. Wilson Bauxite Co. from mines in the Eufaula district in southeastern Alabama. High-silica, low-iron bauxite mined by the Alcoa Mining Co., the largest of the two operators, was dried at its plant nearby, from which it was shipped to the chemical and refractory industries.

TABLE 3.—Production and shipments of crude bauxite from mines in the United States, 1946–50, by States, in long tons

State and year	Production			Shipments to processing plants consumers, and Government stockpiles		
	Crude	Dried bauxite equivalent	Value [1]	Crude	Dried bauxite equivalent	Value
Alabama, Georgia, and Virginia:						
1946	64,371	53,707	$314,594	65,026	54,206	$318,516
1947	58,418	48,492	301,128	58,418	48,492	301,128
1948	74,511	61,807	397,222	74,511	61,807	397,222
1949	65,137	53,868	344,217	56,794	47,194	303,291
1950	32,706	27,192	161,274	35,768	29,621	173,918
Arkansas:						
1946	1,288,764	1,050,347	6,578,270	1,282,099	1,044,939	6,546,469
1947	1,368,693	1,153,563	6,583,538	1,340,988	1,032,035	6,438,697
1948	1,649,926	1,395,341	8,299,486	1,532,697	1,295,693	7,761,679
1949	1,287,358	1,094,924	6,433,964	1,357,118	1,149,143	6,733,096
1950	1,552,047	1,307,335	7,531,535	1,488,333	1,257,232	7,198,685
Total United States:						
1946	1,353,135	1,104,054	6,892,864	1,347,125	1,099,145	6,864,985
1947	1,427,111	1,202,055	6,884,666	1,399,406	1,080,527	6,739,825
1948	1,724,437	1,457,148	8,696,708	1,607,208	1,357,500	8,158,901
1949	1,352,495	1,148,792	6,778,181	1,413,912	1,196,337	7,036,387
1950	1,584,753	1,334,527	7,692,809	1,524,101	1,286,853	7,372,603

[1] Computed from selling price of bauxite shipped from mines.

Arkansas.—Arkansas bauxite was mined entirely from deposits within 25 miles south and southwest of Little Rock.

The Alcoa Mining Co. continued to mine low-silica bauxite in Saline and Pulaski Counties, Ark. Most of the ore from the mines in Saline County was dried at the company drying and calcining plant near Bauxite and shipped to alumina and chemical plants for consumption, but small quantities of undried bauxite were sold directly to the cement and abrasive industries. The Drury drying and calcining plant, serving the Pulaski County mines, shipped dried ore to the alumina and chemical industries and shipped calcined bauxite to abrasive producers. Some crude ore from this area was shipped to other processors.

The Rauch Leased mine was the only one operated by the American Cyanamid Co. in Arkansas during 1950. A drying plant in the Berger district, Pulaski County, near the mines, received ore from inventories at the idle Heckler and Berry Mahan mines, as well as the output from the Rauch Leased mine, and shipped the dried bauxite to chemical and oil-refining plants.

Consolidated Chemical Industries, Inc., did not mine bauxite during 1949 or 1950; however, ore was transferred from existing inventories at the Bierman Tract site, Pulaski County, for treatment at the Peiser Spur concentrating plant.

The Crouch Mining Co., subsidiary of the General Abrasives Co., mined bauxite from its Young mine in Saline County. After calcining at the plant near Bauxite, the ore was shipped for use in the manufacture of abrasives.

In 1950 the Dulin Bauxite Co. continued operating the Nutt-Bailey mine and began mining from the 400 B. C. mine. Most of the bauxite was sold in crude form, largely for alumina production. Ore calcined at the Dulin plant near Sweet Home was used for abrasives. The underground Nutt-Bailey mine was reported to be successfully using internal-combustion engines within the mine. Trailers powered by jeeps were used in the experiment to reduce bauxite-hauling costs.[8]

The Norton Co. resumed mining low-silica bauxite at the Norton mine, Saline County, during 1950. All of the mine production was calcined and shipped to the company plants for making abrasives.

Crude and dried bauxite were purchased from local producers by the Porocel Corp. and activated in its plant in Pulaski County. The finished product was used chiefly for oil refining.

TABLE 4.—Bauxite shipped from mines and processing plants in the United States, 1947–50, by consuming industries, in long tons

Industry	1947		1948		1949		1950	
	As shipped [1]	Dried bauxite equivalent	As shipped [1]	Dried bauxite equivalent	As shipped [1]	Dried bauxite equivalent	As shipped [1]	Dried bauxite equivalent
Alumina	1,032,161	907,852	1,297,617	1,149,070	1,130,573	1,007,457	1,288,139	1,143,481
Chemical	91,728	91,343	102,943	102,943	80,833	80,833	71,156	71,156
Abrasive	86,265	129,126	54,187	82,677	34,122	51,258	47,156	72,125
Other	26,596	31,902	35,461	38,853	33,147	39,189	46,014	50.085
Total:								
Long tons	1,236,750	1,160,223	1,490,208	1,373,543	1,278,675	1,178,737	1,452,465	1,336,847
Value	$8,473,704	----------	$9,963,032	----------	$8,545,106	----------	$9,549,396	----------

[1] Includes crude, dried, calcined, activated, and sintered.

The Reynolds Mining Corp. remained the largest producer of domestic bauxite, although it mined only from its Saline County deposits in 1950. The entire production, generally high-silica ore, was sold to the parent Reynolds Metals Co. and converted to alumina at the Hurricane Creek, Ark., plant.

[8] Brandt, O. Thorsten, Nutt-Bailey Bauxite Mine in Arkansas: Explosives Eng., vol. 28, No. 1, January-February, 1950, pp. 7–11, 28.

The Riffe Construction Co. began operating the open-pit Ratcliffe mine near Sweet Home in 1950. The high-silica bauxite produced was used in the production of alumina.

TABLE 5.—Recovery of processed bauxite in the United States, 1946–50, in long tons

Year	Crude ore treated	Processed bauxite recovered			
		Dried	Activated, calcined, or sintered	Total	Dried bauxite equivalent
1946	708,964	426,618	111,312	537,930	597,509
1947	655,702	410,727	102,320	513,047	564,829
1948	688,898	476,921	68,800	545,721	584,856
1949	597,536	431,158	55,544	486,702	517,412
1950	657,798	480,623	63,713	544,336	579,884

Georgia.—The American Cyanamid Co. was the only bauxite producer in Georgia during 1950. Production came from mines in the Andersonville district, Sumter County, and from Bartow County when the Julia mine was opened late in the year. American Cyanamid Co. continued to dry ore at its plant in Sumter County before shipment to the chemical industry.

CONSUMPTION AND USES

Bauxite consumption totaled 3,332,803 long tons (calculated dried equivalent basis) in 1950, a gain of 24 percent over 1949 and the largest quantity recorded since the war year 1944. Consumption figures presented in this section include calcined bauxite shipped to abrasive plants in Canada for the manufacture of crude abrasives, which are returned to the United States for final manufacture and use, but do not include bauxite entering the National Stockpile. Consumption of bauxite on an "as-received" basis totaled 3,420,996 tons, consisting of 1,109,465 tons of crude ore, 2,151,707 tons of dried ore, 154,915 tons of calcined ore, and 4,909 tons of activated ore. Of the total bauxite consumption in 1950, 47 percent was from domestic sources and 53 percent from foreign. The alumina industry used approximately 87 percent of the total consumption, the abrasive industry 6 percent, the chemical industry 5 percent, the refractory industry 1 percent, and all other industries 1 percent.

TABLE 6.—Bauxite consumed in the United States 1949–50, by industries, in long tons

[Dried-bauxite equivalent]

Industry	1949			1950		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Alumina	907,645	1,380,728	2,288,373	1,317,829	1,573,285	2,891,114
Abrasive	[1] 66,898	[1] 124,857	191,755	100,206	101,715	201,921
Chemical	92,813	49,046	141,859	95,857	67,610	163,467
Refractory	7,195	[1] 15,181	[1] 22,376	7,166	26,018	33,184
Other	23,918	9,452	33,370	35,025	8,092	43,117
Total	[1] 1,098,469	[1] 1,579,264	[1] 2,677,733	1,556,083	1,776,720	3,332,803

[1] Revised figure.

Alumina.—Consumption of bauxite at alumina plants gained 26 percent in 1950, as the four large plants in operation produced 1,552,487 short tons of alumina. On the basis of a weighted average, about 1.86 long dry tons of bauxite were required to produce 1 short ton of alumina.

The Mobile, Ala., plant of the Aluminum Co. of America, which used imported bauxite, was the largest producer in 1950. Alcoa's East St. Louis, Ill., plant used mostly Arkansas ore and was the leading producer of commercial aluminum trihydrate and other special aluminas not to be reduced to metal. The Kaiser Aluminum & Chemical Corp. alumina plant at Baton Rouge, La., operated on South American bauxite. The Hurricane Creek, Ark., plant of Reynolds Metals Co., which had the largest capacity of the alumina plants, continued to extract alumina by the combination process developed during World War II. The sintering facilities at this plant permitted the use of relatively high silica bauxites, which were not economically feasible to process at the other three plants using the straight Bayer process. Silica is removed in the Bayer process in the form of red mud and usually discarded; however, each percent of silica in the bauxite carries with it at least as much alumina and attendant soda. At Hurricane Creek the red mud was sintered with limestone, which tied up the silica as dicalcium silicate. The ground sinter was then returned to the Bayer circuit, where alumina was extracted as sodium aluminate.

At the close of 1950 plans were being formulated to increase bauxite and alumina facilities to meet the requirements of the aluminum expansion program. Most of the additional bauxite supply was expected to come from Jamaica and Surinam. Alcoa had plans for increasing capacity of its Bayer plants at Mobile and East St. Louis and constructing a new combination-process plant near Bauxite, Ark. Kaiser intended to produce additional alumina by expanding Bayer facilities at Baton Rouge. Reynolds planned to expand the Hurricane Creek combination plant and facilities designed for treating Jamaica ores. The sources of alumina for new metal producers had not been determined.

Small quantities of alumina were reported produced from clay, chrome residues, and bauxite by companies other than the aluminum producers. Of the total alumina consumed, an estimated 90 percent was used at reduction plants in producing aluminum. The remainder was for chemicals, aluminum fluoride and cryolite, abrasives, oil refining, refractories, and other uses. Calcined alumina not used for metal production was consumed largely in the manufacture of white aluminous abrasives. Most of the aluminum trihydrate was consumed by the chemical industry or used to produce synthetic cryolite and aluminum fluoride.

Abrasive.—Consumption of bauxite for abrasives increased 5 percent in 1950. The abrasives industry also used alumina made from bauxite, consumption of this bauxite is included with data for alumina in table 6. Bauxite used in the production of abrasives was shipped in calcined form to areas of relatively inexpensive water power, particularly the Niagara Falls region, for electric furnacing. Much of the raw abrasive was produced on the Canadian side of the border, but since it was returned to the United States for final manufacture and consumption, the quantities of bauxite used in these operations are included with United States consumption figures. During 1950 abrasive-grade bauxite was removed from the Group I list of materials being purchased for the National Stockpile.

Chemical.—An increase of approximately 15 percent was noted in the direct consumption of bauxite by the chemical industry in 1950. In addition to bauxite, however, aluminum salts producers reported consumption of 97,553 short tons of clay, 16,929 tons of commercial aluminum trihydrate, 8,423 tons of secondary aluminum, and a small quantity of other aluminum-bearing materials.

TABLE 7.—Aluminum salts produced and shipped in the United States, 1949–50

	1949				1950			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Shippers	Short tons	Value		Shippers	Short tons	Value
Aluminum sulfate:								
Ammonium	604,603	3	601,096	$18,067,991	700,633	2	680,958	$20,463,473
Potassium		2				2		
Sodium		2				1		
General:								
Commercial		13				13		
Municipal	14,151	6	14,141	292,050	14,990	6	15,046	335,069
Iron-free	23,949	6	23,859	1,065,664	39,708	7	39,959	1,834,037
Sodium aluminate	14,237	10	12,890	1,331,277	9,122	8	10,429	1,060,080
Aluminum chloride:								
Liquid	12,576	5	12,439	793,144	13,303	6	13,286	739,202
Crystal	18,104	1	14,997	2,657,208	35,066	2	35,118	6,497,829
Anhydrous		6				8		
Total	687,620	[1] 35	679,422	24,207,334	812,822	[1] 36	794,796	30,929,690

[1] A company shipping more than 1 kind of salt is counted but once in arriving at total.

The total output of aluminum salts increased in 1950 despite a sharp decline in production of sodium aluminate. Significant gains were made in production, sales, and use of anhydrous aluminum chloride, iron-free aluminum sulfate, and general commercial aluminum sulfate. The total value of aluminum salts shipped or used by producers increased 28 percent.

Refractory.—The refractory industry required a consumption of 48 percent more bauxite than in 1949. With rapid depletion of adequate supplies of Missouri diaspore, the refractory industry was relying more on bauxite as a source of aluminous material. It was indicated at the close of 1950 that this trend would be accentuated in the next few years, and refractory-grade bauxite was added to the list of commodities to be purchased for the National Stockpile.

Other Industries.—Total bauxite consumption by the cement, oil-refining, steel and ferro-alloys, water-purifying, and other industries increased 29 percent in 1950.

STOCKS

Total inventories of bauxite at the close of 1950 were 7 percent lower than those reported for the beginning of the year. Stocks at mines and processing plants (including plants engaged in drying, calcining, or activating bauxite) were virtually unchanged, but inventories at consumers' plants were lowered approximately 10 percent from December 31, 1949. Starting in July 1950, Reynolds Metals Co. exercised its option to purchase bauxite in crude form from the Government-owned stockpiles near the Hurricane Creek, Ark., alumina plant. The amount withdrawn during 1950, as reported by General Services Administration, was 183,648 long tons; calculated on a dried-equivalent basis, the average analysis was about 50 percent Al_2O_3 and 10 percent SiO_2. All inventory figures mentioned in this chapter exclude bauxite held by the Bureau of Federal Supply for the National Stockpile.

TABLE 8.—Stocks of bauxite on hand December 31, 1946–50, in long tons

Year	Producers and processors		Consumers		Government, crude [2]	Total	
	Crude	Processed [1]	Crude	Processed [1]		Crude and processed [1] [2]	Dried-bauxite equivalent [2]
1946	547,164	9,853	62,442	181,708	3,277,090	4,078,257	3,516,901
1947	560,967	11,497	35,983	399,224	3,277,090	4,284,761	3,724,759
1948	654,601	7,441	57,191	590,124	3,277,090	4,586,447	4,023,300
1949	[3] 574,983	[3] 8,467	[3] 34,183	[3] 832,083	3,277,090	[3] 4,726,806	[3] 4,184,786
1950	574,167	7,610	38,270	745,834	3,058,766	4,424,647	3,910,002

[1] Dried, calcined, activated, and sintered.
[2] Excludes National Stockpile.
[3] Revised figure.

PRICES

In 1950 the average value, f. o. b. mines and processing plants, was \$4.84 per long ton for crude (undried) bauxite, \$7.66 for crushed dried bauxite, \$16.95 for calcined bauxite, and \$60.73 for activated bauxite. Corresponding values in 1949 were as follows: \$4.98 for crude, \$7.50 for dried, \$16.31 for calcined, and \$16.19 for activated bauxite. The average value for all grades of domestic ore as shipped to consumers was \$6.57 per ton in 1950 (\$6.68 in 1949).

Nominal market quotations published in December by E&MJ Metal and Mineral Markets were as follows: Domestic ore, chemical, crushed and dried, 55 to 58 percent Al_2O_3, 1.5 to 2.5 percent Fe_2O_3, \$8 to \$8.50 f. o. b. Alabama and Arkansas mines; other grades, 56 to 59 percent Al_2O_3, 5 to 8 percent SiO_2, \$8 to \$8.50, f. o. b. Arkansas mines; pulverized and dried, 56 to 59 percent Al_2O_3, 8 to 12 percent SiO_2, \$14 to \$16, f. o. b. Arkansas mines; abrasive grade, crushed and calcined, 80 to 84 percent Al_2O_3, \$17, f. o. b. Arkansas mines; crude (not dried) 50 to 52 percent \$4.50 to \$5.50, f. o. b. Arkansas mines. The quoted price for the last item, crude bauxite, was \$4 to \$5 until late in 1950.

Bauxite from the stockpile at Hurricane Creek was sold to the Reynolds Metals Co. by General Services Administration under a price schedule similar to that used by Metals Reserve in purchasing the ore. The base price was \$4 per ton for bauxite analyzing 13 percent SiO_2 and 50 percent Al_2O_3 on a dry basis. Penalties of 43 cents for each percent of silica over 13 percent and 14 cents for each percent of alumina under 50 and bonuses of 20 cents for each percent of silica under 13 percent and 14 cents for each percent of alumina over 50 were imposed. An escalation provision for changes in labor costs was included in the pricing system.

FOREIGN TRADE

Imports of bauxite in 1950 decreased slightly to 2,476,677 long tons (as shipped). Most bauxite was shipped in the United States after drying to reduce shipping costs and facilitate handling. The duty on crude bauxite and dried bauxite remained at 50 cents per long ton throughout 1950, and the rate of 15 percent ad valorem for calcined bauxite was unchanged for most grades. However, a change from 15 percent ad valorem to $1 per long ton for the duty on calcined bauxite imported for use in the manufacture of fire brick or other refractories was approved September 27, 1950.

Of the total imports, 1,928,011 tons were from Surinam, 447,457 tons from Indonesia, 91,381 tons from British Guiana, and 9,828 tons from all other countries. By customs districts, 1,642,324 tons were received at Mobile, 744,330 at New Orleans, 23,505 at New York, 21,817 at Philadelphia, 12,908 at Virginia, 10,013 at San Francisco, 9,747 at Georgia, 8,650 at Massachusetts, and 3,383 at four other districts.

TABLE 9.—Bauxite and aluminum compounds imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Bauxite			Alumina		Aluminum compounds	
	As imported (long tons)	Dried bauxite equivalent [1] (long tons)	Value	Long tons	Value	Short tons	Value
1946	852,005	851,148	$5,965,124	4	$2,607	2	$654
1947	1,821,580	1,842,176	11,869,631			80	2,348
1948	2,488,915	2,558,037	15,820,743	6	3,547	5,559	124,167
1949	2,688,164	2,730,472	16,353,298	157	19,192	1,472	46,736
1950	2,476,677	2,538,175	15,719,263	194	20,038	3,113	126,715

[1] Calculated by Bureau of Mines.

Exports of bauxite and bauxite concentrates increased in 1950, reversing a downward trend begun in 1944. Bauxite and other aluminum ores comprised 37,150 tons of the 1950 shipments; 8,059 tons was classified as bauxite concentrates, including alumina. Canada, the recipient of over 97 percent of the total exports, used most of the bauxite to produce crude abrasives, which were returned to the United States for final manufacture and consumption.

TABLE 10.—Bauxite and aluminum compounds exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Bauxite (including bauxite concentrates), long tons			Aluminum sulfate		Other aluminum compounds	
	As exported	Dried bauxite equivalent [1]	Value	Short tons	Value	Short tons	Value
1946	97,788	127,840	$1,599,259	37,957	$962,938	4,055	$637,997
1947	94,369	141,235	1,888,040	23,389	706,572	3,753	738,374
1948	54,113	86,284	1,202,036	14,342	467,622	3,539	599,210
1949	34,902	57,628	512,779	14,706	554,710	4,155	664,018
1950	45,209	71,701	1,144,222	13,010	461,653	4,393	742,941

[1] Calculated by Bureau of Mines.

WORLD REVIEW

The world production of bauxite in 1950 was nearly the same as in 1949. The major bauxite output was in the Western Hemisphere; the United States, Surinam, and British Guiana supplied 61 percent of the world total. Production in the U. S. S. R. and satellite countries was estimated at 13 percent and in other European countries, 17 percent. The remaining world output, including Africa, Asia, and the Pacific Islands, was 9 percent of the total. Although Surinam and British Guiana continued the leading producers, both of these colonies produced less than in 1949. Among the major producers (over 100,000 tons a year), France, Italy, and the United States were the only countries that increased output. Estimated production for the U. S. S. R. and Yugoslavia also increased over that for 1949.

The anticipated expansion of the world aluminum industry renewed interest in exploration for bauxite deposits. During 1950 exploration for new deposits and re-evaluation of known deposits were reported in Australia, Brazil, British and French Guiana, France, India, Indonesia, Italy, Malaya, and the West Indies.

Plans for developing Jamaica bauxite deposits were firmly under way; by 1952 this country should join the major producers. Exploitation of Jamaica's deposits represents a major step to supplement Guiana bauxite imports for the North American aluminum industry. Futhermore, the development of the West Indies deposits is important as a security measure; Gulf coast ports are only about 1,000 miles from Jamaica, as compared to 2,500 miles from the Guianas, and the sea route to Jamaica can be patrolled effectively by land-based aircraft.

Other countries planning to enter the bauxite-production field were New South Wales and Tasmania in Australia, Malaya, Taiwan (Formosa), and French Guiana.

TABLE 11.—World production of bauxite, by countries, 1944–50 in metric tons

[Compiled by Pauline Roberts]

	1944	1945	1946	1947	1948	1949	1950
Australia	3,867	3,492	3,789	4,956	5,736	5,377	3,138
Austria	19,843	8,756	----	----	5,324	6,526	616
Brazil	14,589	19,546	17,000	[1] 17,000	[1] 17,000	20,246	([2])
British Guiana	928,178	678,482	[3] 1,137,991	[3] 1,318,190	1,903,230	1,785,860	1,608,831
France	665,630	308,127	449,125	680,123	803,535	757,560	804,396
French West Africa	([2])	([2])	([2])	([2])	([2])	10,400	10,125
Germany: Federal Republic	([2])	([2])	([2])	18,000	([2])	([2])	([2])
Gold Coast	107,854	148,547	116,846	[3] 97,437	[3] 133,055	[3] 147,340	[3] 116,793
Greece	10,000	----	1,315	22,420	40,183	48,852	([2])
Haiti	----	300	300	----	----	----	----
Hungary	758,299	35,402	101,140	340,260	[1] 400,000	[1] 400,000	([2])
India	12,330	14,116	16,668	18,835	20,995	41,302	([2])
Indochina	360	----	----	----	----	----	----
Indonesia	[4] 275,017	([2])	----	24,559	437,822	678,138	551,143
Italy	41,120	25,093	65,447	171,083	153,147	104,852	153,433
Japan	2,000	----	----	----	----	----	----
Malaya	[4] 72,343	----	----	----	----	----	----
Mozambique	6,177	4,369	1,622	2,960	857	1,369	([2])
Palau Island	32,136	----	----	----	----	----	----
Rumania	----	----	663	[1] 600	([2])	([2])	([2])
Spain	2,921	5,119	4,926	5,822	6,805	11,962	12,186
Surinam	[3] 625,804	[3] 683,990	[3] 857,843	[3] 1,809,837	2,149,906	2,126,654	2,080,657
U. S. S. R. (estimate)	355,000	400,000	425,000	475,000	500,000	([2])	([2])
United Kingdom: Northern Ireland	44,502	36,981	----	----	----	----	([2])
United States (dried equivalent of crude ore)	2,869,045	996,754	1,121,774	1,221,348	1,480,535	1,167,230	1,355,946
Yugoslavia	([2])	([2])	55,000	88,000	136,000	[1] 368,000	([2])
Total	6,959,000	3,430,000	4,376,000	6,316,000	8,213,000	8,300,000	8,337,000

[1] Estimate.
[2] Data not available; estimate by authors of chapter included in total.
[3] Exports.
[4] Imports into Japan, Formosa, and Korea in fiscal year ended March 31 of year following that stated; preliminary figures.

Australia.—Australia has in the past been a small producer of bauxite, but with establishment of an aluminum industry in Tasmania production will probably increase. The Australian Aluminum Production Commission has reported 8,600,000 tons of proved reserves under control of the Commission, of which 850,000 tons are in Tasmania and 7,750,000 in New South Wales. Initial production of aluminum in Australia will come from high-grade Malayan ores. Steps have been taken to remove some overburden from deposits at St. Leonards, Tasmania, which contain a lower-grade ore than Malayan deposits, to make the local ore readily available for emergency use.

Brazil.—Brazil has the largest reserves of high-alumina low-iron bauxite in the Western Hemisphere. The Pocos de Caldas deposits are estimated to contain 120 million tons of high-grade ore. Numerous other deposits have been located in the States of Minas Gerais, Espirito Santo, São Paulo, Pará, Maranhão, Baia, and Rio de Janeiro. Plans for reopening an aluminum works constructed at Ouro Preto in the State of Minas Gerais during World War II resulted in renewed prospecting in the area, and bauxite for this plant will be mined from deposits near the alumina facilities. Bauxite from the Pocos de Caldas deposits was planned for use at an aluminum smelter to be built near São Paulo.

British Guiana.—Bauxite production in British Guiana in 1950 was 10 percent less than in 1949 and 15 percent less than in the postwar peak year 1948. Over 90 percent of the bauxite produced in the colony was exported to Canada. The Demerara Bauxite Co., Ltd., announced late in 1950 that supercalcined refractory-grade bauxite ("RASC") will be manufactured in British Guiana. A new drying kiln and expanded railway-transportation facilities planned for 1951 will greatly increase production by this company. A new mining concern, the Plantation Bauxite Co., Ltd., has taken over undeveloped bauxite-mining leases on the west bank of the Demerara River from former holders. Plans called for processing and loading ore produced by this company at facilities of the Demerara Bauxite Co., Ltd.

France.—French bauxite production in 1950 was the largest in history, with the exception of 1943. France was the only major aluminum-producing country that exported large tonnages of bauxite and alumina. Since production of alumina in France exceeded consumption, alumina was available for export. Data on French exports for 1947 to 1949 show that Switzerland, Norway, and Austria were the major foreign consumers of French alumina. The pattern of French bauxite exports has changed in recent years. Italy's imports of this material decreased from 26,000 tons in 1946 to 2,000 tons in 1949, and Norway's from 21,000 tons to zero. Major foreign consumers of French bauxite in 1949 were the United Kingdom (126,000 tons) and Germany (56,000 tons). The 1949 export patterns probably were carried through 1950.

French Guiana.—Gradual depletion of bauxite reserves in Surinam and British Guiana has brought about increased prospecting in French Guiana. Discovery of a large bauxitized zone 80 kilometers from Cayenne and 3 kilometers from a navigable river has been reported. The deposit consists of white bauxite above a stratum of red bauxite. The white bauxite was reported to contain 60 percent Al_2O_3, 1 percent SiO_2, and 0.3 percent Fe. Preliminary estimates were 10,000,000 tons of combined white and red bauxite. Smaller deposits of bauxite were believed to be located on the Island of Cayenne. The Société Pechiney was reported to be exploring for bauxite in French Guiana.

French West Africa.—The Campagnie des Bauxites du Midi made its first shipments of bauxite from the Iles de Loos in 1950. The objective is to export 300,000 tons of bauxite from these deposits by 1952.

Gold Coast.—The British Aluminum Co., Ltd., planned to increase bauxite production at its Gold Coast mines to 300,000 tons a year by addition of mining and processing machinery and of loading facilities at Takoradi.

Greece.—The Greek Government and the Economic Cooperation Administration Mission to Greece signed a series of agreements for carrying out the Greek reconstruction program. Under this program arrangements were made for shipping bauxite to the United States. Greek bauxite was also to be shipped to the Federal Republic of Germany, with repayment to be made in aluminum metal. The Eleusis bauxite mines were to be completely mechanized and production greatly expanded.

Hungary.—Hungary contains the largest bauxite reserves in Europe and during World War II produced over 1 million tons of bauxite a year. Destruction of mining and processing facilities by Germany at the end of the war and removal of the major market—the East Germany alumina plants—by the U. S. S. R. caused bauxite production to decline to 35,400 tons in 1945. Since that date production has been increasing. Although no data are available after 1947, there were indications that production was exceeding ready markets in 1950, and a French firm was requesting assistance in locating potential buyers for large tonnages of Hungarian bauxite. An alumina plant at Almasfuzuto on the Danube, 50 miles northwest of Budapest, was under construction, and operation was planned for 1951. Completion of this plant, with a reported initial capacity of 60,000 tons and a final capacity of 100,000 tons of alumina a year, will provide facilities for treating a large portion of the bauxite production. A large percentage of the alumina produced at this plant will be available for export.

India.—The Geological Survey of India announced discovery of a 300,000-ton bauxite deposit in the Sambhalpur district of Orissa. Bauxite was also discovered in the Belgaum and Kolhapur districts of Bombay, with reserves estimated at 30,000,000 tons. About 10 percent of this material was reported to contain over 50 percent Al_2O_3. As in most Indian bauxite, titania content was high, averaging 6 to 8 percent TiO_2 in the high-alumina ore.

Indonesia.—Bauxite production in Indonesia dropped almost 20 percent from the all-time high output of 1949. Labor difficulties, which temporarily closed the Bintan mines in July, were largely responsible for this decrease. The British Aluminum Co. was reported to be exploring a bauxite deposit at Sambas, West Borneo.

Italy.—Italian bauxite production suffered a severe loss when the Istrian mines were transferred to Yugoslavia by the peace treaty. A large part of the 1950 production was obtained from the Mount Gargano district, and the Italian Government has arranged to increase production in this area. A discovery of bauxite was made in the Calabria region, with reserves estimated at 2 million tons.

Malaya.—No bauxite has been produced in Malaya since the end of the Japanese occupation in 1944. In 1950 interest in Malayan bauxite was renewed. Aluminum Laboratories, Ltd., of Singapore applied for 2,500 acres of land for bauxite mining. Negotiations were underway to use high-grade Malayan ore in the initial operation of the aluminum facilities being constructed in Tasmania.

Surinam.—The 1950 production of bauxite in Surinam, the world's leading producer, was 2,080,657 metric tons, 45,997 tons less than in 1949. The Paranam plant produced 823,444 tons, Moengo 754,201 tons, and Billiton 503,012 tons. The decline in production was caused by operation of the Paranam mine on a two- instead of a three-shift basis and by extensive alterations at the Moengo mill. The bauxite deposits at Moengo were exhausted and abandoned late in 1949, and ore treated at the Moengo plant was mined at Rickanau Hill, about 13 kilometers east of the plant. Another drying kiln to be installed at this plant will increase output capacity to about 1 million tons annually. Late in 1950 plans were under way for opening mining operations at Rorac, 5 miles north of Paranam and on the opposite side of the river; the ore is to be loaded into barges and towed to the Paranam plant for processing. Surinam bauxite ore reserves were estimated as follows: Rickanau (Surinam Bauxite Co.) 40 to 45 million tons, Paranam (Surinam Bauxite Co.) 7.5 million tons, and Paranam (N. V. Billiton Co.) 15 million tons.

Taiwan (Formosa).—A company was formed late in November 1950 to mine bauxite deposits on Quemoy, a small island off the Chinese coast opposite the port of Amoy. The company, partly Government-financed, will produce 1,000 to 1,500 tons of bauxite monthly for the first 2 months and 3,000 tons a month thereafter. The bauxite will be shipped to the Taiwan Aluminum Corp. in Kaohsuing.

U. S. S. R.—No data on bauxite production in the U. S. S. R. are available, and estimates for bauxite production were made from (1) aluminum production estimates, (2) bauxite-consumption–aluminum-production ratio observed in other countries, and (3) the availability of bauxite from foreign countries. Hungary is the only country in the Soviet sphere that contains bauxite deposits and a mining development capable of supplying appreciable tonnages of this material to the U. S. S. R. Most of the U. S. S. R. aluminum facilities are in the eastern part of the Ural Mountains, and Hungarian bauxite for these plants would have to be transported a minimum of 2,000 miles. Thus, bauxite to supply the aluminum industry and other industrial uses located "behind" the Urals has probably been obtained from domestic sources. A large part of U. S. S. R. bauxite production would logically be mined from deposits in the Ural Mountains.

West Indies.—The West Indies have not yet realized any commercial production of bauxite, but the deposits in Jamaica, discovered in 1942, represent the largest known reserves in the Western Hemisphere and are being developed as a source of bauxite for the North American aluminum industry. The discovery of bauxite in Jamaica led to exploration of other islands in the area, and deposits were found in Hispaniola. Areas in Cuba considered to have favorable geologic conditions were investigated by the United States Geological Survey in cooperation with the Cuban Government, but bauxite was not found. The West Indies deposits that have been drilled and sampled to date are estimated to contain at least 350,000,000 tons of high-grade bauxite, of which 90 percent or more is in Jamaica.

The West Indies ores differ markedly in mode of occurrence, physical character, and chemical composition from others in the Western Hemisphere. The principal deposits occur in etched depressions on the broken plateaus of both Hispaniola and Jamaica. These depressions vary from sink holes 50 feet in diameter to huge bowls up to 50 miles in diameter and troughs nearly 20 miles long. There is virtually no overburden to be removed from the deposits. The ores are very porous, and the individual particle size is extremely fine, generally ranging from 0.1 to 1.0 micron. They contain some boehmite, as well as gibbsite. Diaspore is rare or absent. The average Al_2O_3 content is about 50 percent; Fe_2O_3, about 20 percent; and SiO_2, about 2 percent.

Shortly after their discovery, North American aluminum producers became interested in these deposits. In 1943, Jamaican Bauxites, Ltd., a subsidiary of Aluminum, Ltd., acquired property rights in Jamaica. In 1944 Reynolds Metals started active exploration and acquisition of mining rights in Jamaica and Haiti, and Kaiser Aluminum interests took up options on bauxite lands in 1947. Commercial development of Jamaican bauxite was initiated in 1950.

On January 24, 1950, an agreement was made between Reynolds Jamaica Mines, Ltd., and the Strategic Materials Division of Economic Cooperation Administration that the latter would advance up to $5,963,000 in Marshall Plan funds and 1,800,000 pounds sterling from Economic Cooperation Administration counterpart funds in Britain to develop 40 to 50 thousand acres of bauxite property in the St. Anne district owned or controlled by Reynolds. The total cost of the planned development was estimated at $14,500,000 and included, besides mining equipment, a processing mill at the mining operations, a 6-mile aerial conveyor system for transporting processed ore to the harbor, construction of Jamaica's largest, most modern deep-water pier at the west end of Ocho Rios Bay, and construction of a 12,500-ton, self-loading and unloading ore boat. The initial objective is production of 400,000 tons of bauxite per year, with the first shipments to be made in December 1951. The funds advanced by Economic Cooperation Administration are to be repaid over a period of 20 years in aluminum ingot, which will be added to the United States National Stockpile.

Jamaica Bauxites, Ltd., an Aluminum, Ltd., subsidiary, announced plans to construct an alumina plant in Jamaica. Economic Cooperation Administration funds amounting to $2,500,000 and 1,500,000 pounds sterling were advanced to finance the plant, and an additional $1,500,000 in capital costs was advanced by Aluminum, Ltd. Construction will start early in 1951 on a plant that will produce 40,000 tons a year. Bauxite will be mined from properties in Mile Gully near the mountain village of Manderville.

The Kaiser Aluminum & Chemical Corp. purchased properties in St. Elizabeth and took up options on properties in and around the Manchester and Manderville areas of south central Jamaica.

The Jamaica Legislature passed a law to permit the Government to make mining agreements with mining companies, which were to pay a royalty of 1s. a ton or such other royalty as the Government might specify.

Yugoslavia.—Data on bauxite production for 1950 were not available. It was reported that mining was carried on in Istria and near Mostar in Dalmatia and that facilities at Lake Novigrad were being modernized to permit shipments from that area. An agreement was made between the Yugoslav Government and German mining experts to develop bauxite resources of Cherso Island and the Sibenik district. Indications were that increased amounts of Yugolsav bauxite would be consumed in Germany in 1951. Bauxite deposits were discovered in Crna Gora, which are reported to contain several million tons. The alumina facilities at Strniste, planned by the Germans and partially constructed by Germany and the U. S. S. R., were reported as 70 percent complete when Yugoslavia broke from the Cominform. The plants were designed to produce a maximum of 100,000 tons of alumina a year, but the Yugoslav plan was to complete facilities for producing only 60,000 tons.

Bismuth

By Abbott Renick

GENERAL SUMMARY

THE 1950 domestic supply of bismuth metal, the largest ever recorded, exceeded that for 1949 by 24 percent. Increases in both production and imports contributed to this record. Exports of bismuth metal during 1950 increased 4 percent above the 1949 figure, and the United Kingdom again received the major portion. Stocks of metal held by producers were 22 percent higher on December 31, 1950, than at the end of 1949.

Peru continued in 1950 to be the largest foreign producer of refined metal. Canadian production of bismuth was substantially increased.

The price of refined bismuth in 1950 held at $2 per pound, in ton lots, until September 5, when it was advanced to $2.25.

DOMESTIC PRODUCTION

Virtually all domestic production of bismuth is derived as a byproduct from the smelting of lead ores and the refining of imported bismuth bars containing lead as a major impurity. The Bureau of Mines is not at liberty to divulge production figures, but 1950 output increased 17 percent over that in the previous year. This rise was due to increased domestic lead production and imports of bismuth bars during the year.

Companies reporting output of refined bismuth metal in 1950 were American Smelting & Refining Co., at Omaha, Nebr., and Perth Amboy, N. J.; Anaconda Copper Mining Co., at Anaconda, Mont.; and U. S. S. Lead Refinery, Inc. (subsidiary of United States Smelting, Refining & Mining Co.) at East Chicago, Ind. The Cerro de Pasco Copper Corp. is the principal domestic producer of bismuth alloys at its Brooklyn, N. Y. plant; bismuth metal used is obtained from the company lead smelter at La Oroya, Peru.

CONSUMPTION AND USES

Demand for bismuth, particularly in the form of refined metal, was firm in 1950. Bismuth consumption in the pharmaceutical industry increased 5 percent. During the final months of 1950, retooling of the aircraft industry increased demand substantially. Bismuth continued to play an important part in nuclear energy.

TABLE 1.—Percentage distribution of bismuth in the United States, 1946–50, by major use groups [1]

Use group	1946	1947	1948	1949	1950
Pharmaceuticals	63	52	49	31	36
Metal and alloys [2]	37	48	51	69	64

[1] Computed from figures by Civilian Production Administration, 1946, and by Bureau of Mines, 1947–50.
[2] Principally fabricating alloys but includes pure metal, ammunition solders, fuse alloys, aluminum alloys, and other minor compositions.

STOCKS

Producers' inventories of refined bismuth metal at the end of 1950 increased 22 percent above the end of 1949. High-grade metal was accumulated during the year for the National Stockpile.

PRICES

Refined bismuth metal was quoted in 1950 by E&MJ Metal and Mineral Markets at $2 per pound until September 5, when it was advanced to $2.25, a level maintained until the end of the year. The Metal Bulletin (London) quotation for high-purity metal, United Kingdom home trade, 5 cwt. minimum, held fairly steady at 14s. 6d. per pound from January to May 4. Subsequent fluctuations were recorded as follows: May 26, 13s. 9d.; August 4, 14s. 6d.; September 29, 17s. Bismuth ore, per pound of contained metal, c. i. f., United Kingdom home trade, was quoted December 5 at 10s. 10d., 65 percent minimum Bi, scaling downward to 2s. 3d. for ore assaying below 20 percent.

FOREIGN TRADE [1]

Imports.—Receipts of refined metal in 1950 showed a rise of 44 percent above 1949 and were the highest on record. The approximate percentage distribution of receipts, by country of origin, was: Peru 56, Canada 26, Yugoslavia 10, Belgium-Luxembourg 3, Japan 2, Korea 1, and others 2.

Exports.—Outgoing shipments of bismuth metal and alloys in 1950 increased 4 percent above a year earlier. The United Kingdom was again the principal recipient, taking 152,173 pounds; France received 44,814 pounds.

TABLE 2.—Bismuth metal and alloys imported into and exported from the United States, 1941–45 (average) and 1946–50

[U. S. Department of Commerce]

Year	Imports of refined metallic bismuth		Exports of metal and alloys	
	Pounds	Value	Pounds	Value
1941–45 (average)	270, 312	$265, 539	118, 078	$124, 062
1946	422, 336	464, 922	153, 058	173, 463
1947	310, 561	480, 808	240, 833	452, 147
1948	299, 824	464, 733	352, 027	711, 354
1949	541, 852	833, 940	190, 882	356, 576
1950	781, 670	1, 287, 098	199, 253	387, 458

TECHNOLOGY

The use of ductile bismuth wire and ribbon in the instrument control field was the subject of research.[2]

The use of bismuth carbonate in peptic ulcer therapy was described.[3]

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

[2] Materials & Methods (London), Ductile Bismuth: Vol. 33, No. 5, May 1951, p. 104.

[3] Kemp, S. K., Bismuth Carbonate in Peptic Ulcer Therapy: Mining and Chemical Products Ltd. (London), 1950, 23 pp. (pamphlet).

TABLE 3.—World production of bismuth, 1943–50, by countries, in kilograms [1]

[Compiled by Berenice B. Mitchell]

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
Argentina: Metal	18,000	14,000	20,120	22,000	22,000	(2)	(2)	(2)
In ore [3]	25,000	24,500	31,000	12,000	20,000	(2)	(2)	(2)
Australia (in ore) [4]	5,741	3,556	3,251	1,118	4,369	4,064	111	68
Belgian Congo (in ore)	-----	-----	-----	-----	815	456	540	668
Bolivia (in ore and bullion exported) [5]	12,419	605	15,337	27,867	88,964	35,142	8,222	(2)
Canada (metal) [6]	184,882	56,188	86,098	109,090	128,988	108,971	46,680	101,152
China (in ore) [3]	(2)	(2)	-----	1,380	(2)	(2)	(2)	(2)
France (in ore)	4,000	3,000	-----	-----	55,000	56,000	[3] 30,000	(2)
Japan (metal)	[7] 66,000	[7] 54,000	20,000	15,914	22,862	23,327	25,946	33,049
Korea, South	(2)	(2)	(2)	-----	-----	104,000	173,420	(2)
Mexico (in impure bars)	175,055	165,379	161,368	76,000	256,000	154,000	249,000	263,000
Peru: Metal	482,920	416,159	307,446	221,778	233,794	205,861	213,137	(2)
In lead-bismuth alloy	-----	-----	1,500	89,665	3,043	47,225	2,398	(2)
Spain (metal)	15,198	4,910	10,071	13,756	21,172	24,269	19,854	(2)
Sweden	-----	-----	-----	12,441	10,998	-----	(2)	(2)
Union of South Africa (in ore)	1,890	818	610	711	-----	437	5,045	7,649
United States	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)
World production (estimate)	1,400,000	1,200,000	1,100,000	900,000	1,200,000	1,300,000	1,400,000	1,500,000

[1] Bismuth is believed to be produced also in Brazil, Burma, Germany, Norway, Rumania, Uganda, U. S. S. R., United Kingdom, and Yugoslavia. Production figures are not available for these countries, but estimates by author are included in total.
[2] Data not available. Estimate by author included in total.
[3] Estimate.
[4] Partly estimated. Excludes content of some bismuth-tungsten concentrates.
[5] Excludes bismuth content of tin concentrates exported.
[6] Refined metal plus bismuth content of bullion exported.
[7] Incomplete data for year ended March 31 of year following that stated.
[8] Production included in total; Bureau of Mines not at liberty to publish separately.

WORLD REVIEW

Belgian Congo.—Bismuth is recovered as a byproduct of tin mining by Cie. Minière de Grands Lacs Africains (MLG) and Cie. Minetain. Production during the first 6 months of 1950 amounted to 1 ton.[4]

Canada.—The Consolidated Mining & Smelting Co. of Trail, B. C., continued during 1950 as the only Canadian bismuth producer. Recoveries of bismuth metal, all at the Trail smelter, amounted to 97 tons. About 40 tons are used each year in Canada, and the remainder is exported.

France.—Mines et Usines de Salsigne, which began to produce bismuth metal of 95 percent purity during July 1950 reached a rate of 5 tons a month in October.[5]

South Korea.—Bismuth output in Korea increased from 104 metric tons in 1948 to 173 tons in 1949. No production was reported for 1950.[6]

Union of South Africa.—In 1949, 12 short tons of bismuth ore was produced and shipped to the United Kingdom.[7]

[4] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 3, September 1950, p. 9.
[5] Metal Bulletin (London), No. 3539, Nov. 3, 1950, p. 19.
[6] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 1, July 1950, p. 4.
[7] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 2, August 1950, p. 4.

Cadmium

By Richard H. Mote

GENERAL SUMMARY

DESPITE record production and large imports, additions to the domestic supply of cadmium during 1950 were insufficient to meet total demand during the year. The all-time high output of primary cadmium—12 percent greater than in 1949—combined with the second highest level of imports in history, failed to meet the expanding requirements of the latter half of the year; and, as a result, stocks were substantially reduced. The quotation for commercial sticks, which remained steady at $2.00 per pound throughout 1949 had, by December 1950, advanced to $2.55 per pound. Shipments of metallic cadmium were 22 percent above the previous year's total and exceeded production by 745,000 pounds. Industry stocks, rebuilt to adequate proportions during 1949, were reduced 16 percent, but purchases for the National Stockpile were continued. Apparent consumption increased 30 percent from 1949.

TABLE 1.—Salient statistics of the cadmium industry in the United States, 1941–45 (average) and 1946–50, in pounds of contained cadmium

	1941–45 (average)	1946	1947	1948	1949	1950
Production (primary)	8,046,990	6,471,187	8,508,146	7,775,657	[2] 8,226,617	9,206,097
Imports (metal)	68,984	17,415	20,292	9,809	157,204	630,109
Exports (metal)	[1] 264,529	140,385	303,401	955,701	566,135	352,927
Consumption, apparent	8,062,760	6,983,610	7,726,753	7,797,105	[2] 7,486,274	9,625,768

[1] 1942–45 average.
[2] Revised figure.

DOMESTIC PRODUCTION

The most important of the cadmium minerals is greenockite (CdS), theoretically containing 77.8 percent cadmium. The mineral occurs in the form of a yellow powder or stain on the mineral sphalerite or zinc blende (ZnS). Greenockite is almost always associated with sphalerite zinc ores and to a smaller extent with the ores of lead and copper containing zinc mineralization. It is never present in adequate quantities, however, to support profitable mining. Some zinc concentrates have been reported to contain as much as 1 percent cadmium; in general, however, the content seldom exceeds 0.5 percent. Zinc concentrates from the Tri-State district average 0.35 percent cadmium, and concentrates from mines in the Rocky Mountain region and far West rarely yield more than 0.2 percent cadmium.

TABLE 2.—Cadmium produced and shipped in the United States, 1941–45 (average) and 1946–50, in pounds of contained cadmium

	1941–45 (average)	1946	1947	1948	1949 [1]	1950
Production:						
Primary:						
Metallic cadmium	7,808,724	6,200,398	8,007,287	7,582,961	8,023,616	8,865,393
Cadmium compounds [2]	238,266	270,789	500,859	192,696	203,001	340,704
Total primary production	8,046,990	6,471,187	8,508,146	7,775,657	8,226,617	9,206,097
Secondary (metal and compounds) [3]	207,518	355,104	104,764	121,159	384,398	513,198
Shipments by producers:						
Primary:						
Metallic cadmium	7,818,862	6,180,265	7,852,907	7,639,113	7,867,486	9,610,602
Cadmium compounds [2]	243,593	270,789	500,859	192,696	203,001	340,704
Total primary shipments	8,062,455	6,451,054	8,353,766	7,831,809	8,070,487	9,951,306
Secondary (metal and compounds) [2] [3]	208,734	360,924	134,793	121,159	384,398	513,198
Value of primary shipments:						
Metallic cadmium	$6,070,229	$6,094,572	$12,358,526	$12,679,571	$14,813,382	$19,855,049
Cadmium compounds [4]	187,850	267,033	788,352	319,875	381,642	701,850
Total value	6,258,079	6,361,605	13,146,878	12,999,446	15,195,024	20,556,899

[1] Revised figures.
[2] Excludes compounds made from metal.
[3] Bureau of Mines not at liberty to publish figures separately for secondary cadmium compounds.
[4] Value of metal contained in compounds made directly from flue dust or other cadmium raw materials (except metal).

The entire domestic supply of primary cadmium is recovered concurrently with the treatment of ores of other metals as a byproduct from the flue dusts of zinc-blende roasting furnaces and lead blast furnaces, from zinc dust collected in the early stages of distillation in zinc retorts, and from the high-cadmium precipitate obtained in purifying zinc electrolyte at electrolytic zinc plants. A small quantity of secondary metal is recovered from old bearings and other alloys but constitutes no great portion of the total supply. As most reduction plants participating in the recovery of cadmium treat both domestic and foreign cadmium-bearing materials without determining the cadmium content of either, the geographic origin of the metal produced from domestic plants is a matter of conjecture. Thus the data presented as domestic cadmium production in this chapter are not comparable to those given in other chapters of this volume for metals like copper, lead, and zinc.

The domestic output of primary metallic cadmium and the production of cadmium contained in primary compounds increased 10 percent and 68 percent, respectively, in 1950. Recovery of cadmium in secondary metal and compounds advanced 34 percent.

A list of plants producing cadmium metal in the United States in 1950 follows.

Primary metallic cadmium

Colorado: Denver—American Smelting & Refining Co.
Idaho:
- Bradley—Bunker Hill & Sullivan Mining & Concentrating Co.
- Kellogg—Sullivan Mining Co.

Illinois:
- Depue—New Jersey Zinc Co.
- East St. Louis—American Zinc Co. of Illinois.

Montana: Great Falls—Anaconda Copper Mining Co.

Oklahoma:
- Bartlesville—National Zinc Co., Inc.
- Henryetta—Eagle-Picher Mining & Smelting Co.

Pennsylvania:
- Donora—American Steel & Wire Co.
- Josephtown—St. Joseph Lead Co.
- Palmerton—New Jersey Zinc Co.

Texas:
- Corpus Christi—American Smelting & Refining Co.
- Dumas—American Zinc Co. of Illinois

Secondary metallic cadmium

Arkansas: Jonesboro—Arkansas Metals Co.

Output of cadmium oxide (by cadmium content) increased slightly more than 1 percent during the year, while the cadmium content of sulfide produced advanced 57 percent. Data for the production of other cadmium compounds are unavailable for 1950.

TABLE 3.—Cadmium oxide and cadmium sulfide produced in the United States, 1945–50, in pounds

Year	Oxide		Sulfide [1]		Year	Oxide		Sulfide [1]	
	Gross weight	Cd content	Gross weight	Cd content		Gross weight	Cd content	Gross weight	Cd content
1945	439,415	383,553	1,731,510	637,667	1948	334,859	291,847	3,137,035	1,096,770
1946	364,285	317,767	3,637,177	1,225,680	1949	570,993	497,876	2,631,888	999,386
1947	449,847	392,556	3,501,508	1,308,385	1950	579,538	505,336	4,383,943	1,570,522

[1] Includes cadmium lithopone and cadmium sulfoselenide.

CONSUMPTION AND USES

The apparent consumption of primary cadmium in all forms totaled 9,625,768 pounds in 1950, as computed by adding production and net imports and adjusting for producers', distributors', and compound manufacturers' stock changes. This figure reflected a 29 percent increase over the quantity apparently consumed in 1949. In 1950, as in the previous 2 years, cadmium metal was purchased by the Federal Government for the National Stockpile. About 95 percent of available cadmium is used in electroplating, bearing alloys, and pigments. The remaining 5 percent goes into miscellaneous alloys, laboratory reagents, and photographic chemicals.

Electroplating.—The principal use of cadmium metal is as a protective coating for iron and steel, and, to a much smaller extent, copper alloys. Its chief advantages as an electroplating medium compared to zinc are as follows: (1) Thinner coatings provide equal protection; (2) the rate of deposition for a given quantity of electric current is larger, hence electricity costs are reduced; (3) cadmium retains its metallic luster longer; (4) plated parts are more easily soldered; (5) cadmium has a greater resistance to atmospheric corrosion; (6) it is superior in throwing power, or ability to deposit uniformly in recesses; and (7) corrosion by galvanic action is more effectively minimized. A disadvantage of cadmium plating is its low resistance to acids. Items commonly electroplated with cadmium include nails, screws, rivets, bolts, nuts, washers, fasteners, and miscellaneous parts for a wide variety of products, including aircraft, ordnance, and automobiles.

Cadmium-Bearing Alloys.—Cadmium-base bearing metals are used successfully in internal-combustion engines that operate at high speeds and temperatures. The bearing alloys are generally of two types—the cadmium-nickel bearing, composed of 98.5 percent or more cadmium and 1.2 percent nickel, and the cadmium-silver bearing, containing 98.3 percent or more cadmium, 0.7 percent silver, and 0.6 percent copper. "Graphalloy," a cadmium-impregnated graphite containing 30 to 35 percent cadmium, is used in oilless bearings, bushing linings, and contacts for controller switches.

Cadmium Solders and Other Cadmium Alloys.—A minor use of cadmium metal is in the manufacture of low-melting-point alloys for soldering and brazing and fusible alloys for sprinkler apparatus, fire-detector systems, and valve seats for high-pressure gas containers.

Cadmium Compounds.—Cadmium sulfide and cadmium sulfoselenide are standard agents for producing yellow and red colors, respectively, in paint, soap, rubber, ceramics, paper, printing ink, and other products. Virtually all the cadmium oxide, hydrate, and chloride produced is used in cadmium plating solutions. Cadmium bromide, chloride, and iodide are used in photographic films, process engraving, and lithographing. A table listing the more important cadmium compounds, their physical properties, and uses can be found in the Cadmium chapter of Minerals Yearbook, 1949, pp. 187–188.

STOCKS

Total domestic stocks of cadmium metal and compounds, excluding consumers' stocks, for which data are not available, decreased 16 percent. Details are given in table 4.

TABLE 4.—Cadmium stocks at end of year, 1949–50, in pounds of contained cadmium [1]

	1949 [2]			1950		
	Metallic cadmium	Cadmium compounds	Total cadmium	Metallic cadmium	Cadmium compounds	Total cadmium
Producers	502,462		502,462	521,811		521,811
Compound manufacturers	9,655	164,189	173,844	15,378	134,713	150,091
Distributors [3]	185,250	40,499	225,749	48,715	38,949	87,664
Total stocks [4]	697,367	204,688	902,055	585,904	173,662	759,566

[1] Excludes cadmium in National Stockpile.
[2] Figures partly revised.
[3] Comprises principally 8 largest dealers.
[4] Excludes consumers' stocks, which were about 1,000,000 pounds at the end of 1944 (latest date for which figures were compiled).

PRICES

The quoted New York price of $2.00 a pound for commercial sticks of cadmium, established November 15, 1948, continued through June 14, 1950. Effective June 15 the quotation advanced to $2.15 a pound. On the same day the price for patented shapes was raised from $2.15 a pound to $2.30. On September 15, the quotation for commercial sticks advanced to $2.40 a pound and for patented shapes to $2.65.

A further rise to $2.55 a pound for commercial sticks occurred December 1.

The London market quoted 14s. 6d. ($2.03) per pound from January through June 21, when the price was advanced to 15s. 6d.($2.17). On September 18 and November 2 further rises occurred—to 17s. 3d. ($2.41) and 18s. ($2.52), respectively. The final increase to 19s. ($2.66) took place during the first week of December.

FOREIGN TRADE [1]

Total imports for consumption of metallic cadmium and of cadmium contained in flue dust increased 15 percent in weight and 59 percent in value in 1950. The total value of exports decreased 37 percent.

Imports.—Imports of cadmium-bearing flue dust, all derived from Mexico, were 11 percent below the 1949 level. Imports of metallic cadmium, however, increased four times over the quantity reported for 1949 and were the second highest in history. Of the more than 630,000 pounds imported, Canada supplied 38 percent, 31 percent came from Japan, 23 percent from Belgium-Luxembourg, and 5 percent from the Netherlands. Australia, Italy, Peru, New Zealand, Egypt, and the United Kingdom supplied smaller quantities.

TABLE 5.—Cadmium metal and flue dust imported for consumption in the United States, 1948–50, by countries

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Metallic cadmium						
Australia			7,210	$7,919	7,918	$21,528
Belgium-Luxembourg			48,503	101,560	143,825	518,552
Canada	6,300	$14,491	68,140	139,392	237,494	472,322
Egypt					1,240	2,292
Italy					4,400	10,120
Japan			31,640	50,742	194,745	368,084
Netherlands					34,205	95,031
New Zealand					2,264	6,722
Peru	3,509	7,018	1,711	3,422	3,010	6,624
United Kingdom					1,008	2,621
Total metallic cadmium	9,809	21,509	157,204	303,035	630,109	1,503,896
Flue dust (Cd content)						
Australia	621	303				
Brazil			2,906	2,801		
Mexico	1,827,518	1,437,833	1,786,761	1,593,142	1,601,640	1,519,104
Total flue dust	1,828,139	1,438,136	1,789,667	1,595,943	1,601,640	1,519,104
Grand total	1,837,948	1,459,645	1,946,871	1,898,978	2,231,749	3,023,000

Exports.—Shipments to European Recovery Program "participating countries" accounted for 97 percent of the cadmium metal exported from the United States in 1950. Of the 352,927 pounds shipped—38 percent less than in 1949—Germany received 36 percent, the United Kingdom 27 percent, France 20 percent, Sweden 9 percent,

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

and the Netherlands 3 percent. The remaining 5 percent was distributed among 14 other countries. Exports of cadmium alloys tripled, rising from 3,000 pounds in 1949 to more than 9,000 in 1950. Canada received 73 percent of the total and the Union of South Africa the remainder.

TABLE 6.—Cadmium exported from the United States, 1948–50, by kinds, in gross weight

[U. S. Department of Commerce]

Kind	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Dross, flue dust, residues, and scrap	92,847	$55,247	500	$125		
Metal	955,701	1,872,467	566,135	1,264,307	352,927	$794,540
Alloys	1,506	2,657	3,000	6,150	9,106	11,575
Total		1,930,371		1,270,582		806,115

Tariff.—Action taken at the Geneva Trade Conference of 1947 reduced, as of January 1, 1948, the import duty on cadmium metal from 7½ cents per pound as established in the Canadian Trade Agreement of 1939 to 3¾ cents per pound. Cadmium contained in flue dust remained duty free in 1950.

WORLD PRODUCTION

World production of cadmium in recent years, insofar as data are available, is shown in table 7.

TABLE 7.—World production of cadmium, by countries, 1944–50, in kilograms

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950
Australia (Tasmania)	271,610	245,955	231,913	209,030	293,352	271,133	287,603
Belgian Congo	21,544	18,213	16,571	26,040	18,056	24,635	[1] 36,000
Belgium	[1] 1,089	(2)	[3] 88,900	[3] 86,300	[3] 157,900	[3] 148,000	(2)
Canada	239,032	293,048	364,073	325,874	347,491	383,983	378,393
France	5,250	7,000	47,000	43,000	50,067	58,123	(2)
Germany	209,105	(2)	[4] 1,000	[4] 1,206	[4] 3,500	[4] 5,000	(2)
Italy	38,855	28,800	40,000	38,400	47,000	73,000	[5] 42,000
Japan	[6] 85,000	[7] 22,000	7,509	8,710	30,000	52,484	90,348
Mexico [8]	682,295	1,052,766	717,000	778,000	905,000	820,000	689,000
Norway	10,600	13,000	28,000	50,000	62,000	71,400	(2)
Peru	2,174	9,320	850	1,407	1,592	800	(2)
Poland	195,044	49,150	115,000	[9] 71,000	(2)	(2)	(2)
South-West Africa [10]					517,000	755,000	787,000
U. S. S. R	[11] 50,000	(2)	(2)	(2)	(2)	(2)	(2)
United Kingdom	206,541	222,713	121,925	106,440	115,769	102,662	118,878
United States:							
Metallic cadmium	3,834,409	3,598,139	2,812,439	3,632,025	3,439,555	3,639,432	4,021,254
Cadmium compounds (Cd content)	148,045	204,592	122,827	227,185	87,405	92,079	154,540
Total (estimate)	5,318,000	4,764,000	4,048,000	4,927,000	4,844,000	5,113,000	5,619,000

[1] Exports.
[2] Data not available; estimate by author of chapter included in total.
[3] Estimate.
[4] Bizonal area.
[5] January to September, inclusive.
[6] Preliminary data for fiscal year ended Mar. 31 of year following that stated.
[7] April to September, inclusive.
[8] Cadmium content of flue dust exported for treatment elsewhere; represents in part shipments from stocks on hand. To avoid duplication of figures, data are not included in the total.
[9] January to July, inclusive.
[10] Cadmium content of concentrates exported for treatment elsewhere. To avoid duplication of figures, data are not included in the total.
[11] Estimated average for 1936–38.

Carbon Black

By D. S. Colby, H. J. Barton, and B. E. Oppegard

GENERAL SUMMARY

TOTAL sales of carbon black produced in the United States increased 34 percent to 1,509 million pounds in 1950. Production totaled 1,382 million pounds, a 13-percent increase. Producers' stocks declined 127 million pounds to 90 million pounds.

Production rose in all reporting districts and States except Oklahoma; largest increases took place in Louisiana and Texas (other than Panhandle). Production of furnace blacks increased 28 percent to 765 million pounds and contact-black production declined 2 percent to 617 million pounds.

Sales in 1950 expanded more rapidly than production. Sales of furnace blacks increased 42 percent and sales of contact blacks 25 percent; the greater expansion in the former was occasioned by synthetic rubber consumption increasing at the expense of natural rubber. All classes of consumers used larger quantities of carbon blacks in 1950. Consumption by rubber companies rose 263 million pounds to 1,030 million pounds. The ink and paint industries purchased 59 percent more in 1950 than in 1949. Exports were 32 percent higher.

TABLE 1.—Salient statistics of carbon black produced from natural gas and liquid hydrocarbons in the United States, 1946–50

	1946	1947	1948	1949	1950
THOUSAND POUNDS					
Production:					
Contact process (chiefly channel)	619,109	653,966	677,133	627,650	616,765
Furnace processes	625,312	664,999	620,596	595,986	765,225
Total	1,244,421	1,318,965	1,297,729	1,223,636	1,381,990
Sales:					
Domestic	998,655	1,000,684	932,433	822,166	1,109,071
Export	271,085	319,076	321,915	303,244	399,568
Total	1,269,740	1,319,760	1,254,348	1,125,410	1,508,639
Losses	458	321	250	8	269
Stocks of producers Dec. 31	76,228	75,112	118,243	216,461	89,543
VALUE					
Production thousand dollars	59,988	70,639	76,295	74,685	84,604
Average per pound cents	4.82	5.36	5.88	6.10	6.12

Stocks of both contact and furnace blacks declined sharply during 1950. On December 31 stocks of contact black totaled 65 million pounds, equivalent to a 36-day supply. Stocks of furnace blacks totaled 24 million pounds, a 10-day supply.

The quantity of natural gas used in the production of carbon blacks decreased slightly to 411 billion cubic feet in 1950. The use of liquid hydrocarbons, however, increased by nearly 50 percent to 108 million gallons.

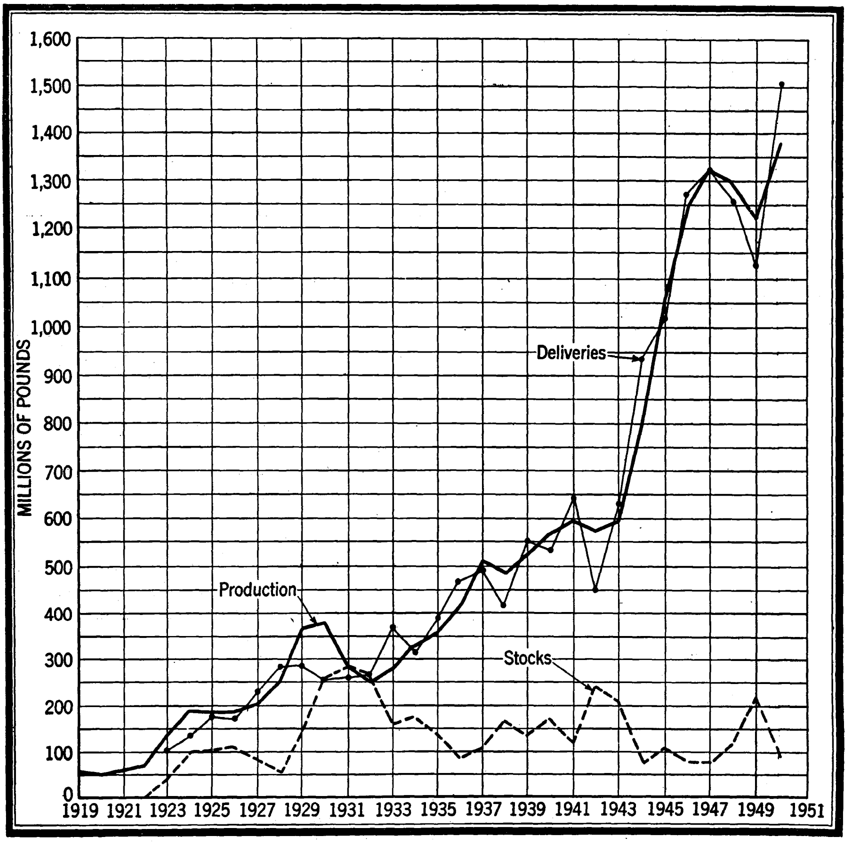

FIGURE 1.—Production, stocks, and deliveries of carbon black, 1919–50

The value at plants of the total output of carbon black in 1950 was $84,604,000. The average value was 6.12 cents per pound, only slightly higher than the 1949 average.

The number of plants operating during 1950 was 53 compared with 63 (revised figure) during 1949. Only one of the plants shut down was a furnace plant.

PRODUCTION

By States.—Production increased significantly in Louisiana (41 percent above 1949) and in Texas outside the Panhandle (25 percent above 1949). Only in Oklahoma did production decline, the result of two plants being shut down. Production in the Texas Panhandle district increased 2 percent in 1950 but did not reach the record production of 1948. In 1950 Texas supplied 68.7 percent of all carbon black produced in the country compared with 71.5 percent in 1949.

By Months.—In general, output of both furnace and contact grades of carbon black rose steadily during 1950. The rate of increase was approximately 1 percent per month for contact grades and 4 percent per month for furnace grades.

TABLE 2.—Carbon black produced from natural gas and liquid hydrocarbons in the United States, 1946–50, by States and districts, in thousand pounds

State and district	1946	1947	1948	1949	1950
Louisiana	191,857	190,252	165,032	160,460	226,177
Texas:					
Panhandle district	596,678	633,250	653,480	625,760	638,159
Rest of State	234,172	262,523	249,904	249,083	310,705
Total Texas	830,850	895,773	903,384	874,843	948,864
Other States	221,714	232,940	229,313	188,333	206,949
Grand total	1,244,421	1,318,965	1,297,729	1,223,636	1,381,990

TABLE 3.—Carbon black produced in the United States in 1950, by States and districts, and natural gas and liquid hydrocarbons used in its manufacture

State	Producers reporting[1]	Number of plants	Production					
			Furnace black			Contact black		
			Thousand pounds	Value at plant		Thousand pounds	Value at plant	
				Total (thousand dollars)	Cents per pound		Total (thousand dollars)	Cents per pound
Louisiana	6	7	223,127	9,795	4.39	3,050	309	10.13
Texas:								
Panhandle district	12	22	305,454	18,089	5.92	332,705	23,952	7.20
Rest of State	6	14	130,642	7,893	6.04	180,063	12,625	7.01
Total Texas	14	36	436,096	25,982	5.96	512,768	36,577	7.13
California	1	1						
Oklahoma	1	1	106,002	4,489	4.23	--------	--------	--------
Kansas	3	3				100,947	7,452	7.38
New Mexico	5	5	--------	--------	--------			
Grand total	20	53	765,225	40,266	5.26	616,765	44,338	7.19

State	Natural gas used					Liquid hydrocarbons used	
	Million cubic feet	Average yield (pounds per M cubic feet)		Value		Thousand gallons	Average yield (pounds per gallon)
		Furnace	Contact	Total (thousand dollars)	Average (cents per M cu. ft.)		
Louisiana	21,989	8.41	1.07	1,050	4.78	15,862	3.92
Texas:							
Panhandle district	206,979	7.29	1.68	10,402	5.03	80,321	2.95
Rest of State	106,055	7.53	1.95	4,454	4.20	11,524	2.29
Total Texas	313,034	7.43	1.77	14,856	4.75	91,845	2.87
California							
Oklahoma		6.71	---------				
Kansas	[2] 75,829		1.68	[3] 3,771	[3] 4.97	---------	---------
New Mexico		---------					
Grand total	410,852	7.56	1.75	19,677	4.79	107,707	3.02

[1] Detail will not add to totals, because some producers operate in more than 1 area.

[2] Comprises 15,800 million cubic feet used by furnace-plant operations in California, Oklahoma, and Kansas and 60,029 million cubic feet used by contact-plant operations in Kansas and New Mexico.

[3] Comprises 945 thousand dollars (5.98 cents per M cu. ft.) of natural gas used in California, Oklahoma, and Kansas for manufacture of furnace black and 2,826 thousand dollars (4.71 cents per M cu. ft.) used in Kansas and New Mexico for manufacture of contact black.

By Grades.—Production of furnace blacks in 1950 increased 28 percent compared with 1949, while the production of contact blacks was 2 percent below 1949. Furnace blacks represented 55 percent of the total production in 1950 compared with 49 percent in 1949. The rising price of natural gas and restrictions on the use of natural rubber caused the shift to furnace blacks.

In 1950, statistics were obtained for the first time on the production of furnace blacks by grades. The grades reported and their symbols are: Semireinforcing Furnace, SRF; High-Modulus Furnace, HMF; Fast-Extrusion Furnace, FEF; High-Abrasion Furnace, HAF; and "Other," which includes thermal blacks and miscellaneous furnace grades.

A larger volume of SRF was produced than of any other furnace grade. The rise in production of this grade during the year was also greater than that of other grades.

TABLE 4.—Production and shipments of carbon black in the United States in 1950, by months, in thousand pounds

Month	Furnace						Contact	Total
	SRF	HMF	FEF	HAF	Other	Total		
PRODUCTION								
January	11,084	7,628	11,866	13,716	6,270	50,564	48,192	98,756
February	10,561	7,995	10,522	12,577	6,567	48,222	45,007	93,229
March	15,037	6,048	11,840	14,152	7,921	54,998	50,465	105,463
April	16,570	5,261	11,840	14,406	7,540	55,617	49,865	105,482
May	17,610	5,551	13,710	15,571	7,854	60,296	51,573	111,869
June	18,945	6,386	12,751	14,814	8,098	60,994	49,066	110,060
July	19,586	7,251	12,481	18,799	8,255	66,372	51,894	118,266
August	19,842	9,245	15,212	19,102	8,579	71,980	52,601	124,581
September	20,371	9,464	14,851	18,831	8,470	71,987	52,693	124,680
October	21,929	11,194	16,678	16,965	8,766	75,532	55,351	130,883
November	21,452	10,471	16,041	18,380	7,470	73,814	54,442	128,256
December	20,064	11,592	15,880	19,100	8,213	74,849	55,616	130,465
Total	213,051	98,086	163,672	196,413	94,003	765,225	616,765	1,381,990
SHIPMENTS (INCLUDING EXPORTS)[1]								
January	17,458	8,942	11,201	12,661	7,390	57,652	56,361	114,013
February	16,910	9,279	12,685	11,916	7,356	58,146	53,487	111,633
March	18,248	8,298	12,722	16,112	8,024	63,404	54,807	118,211
April	18,666	9,138	11,940	15,236	7,027	62,007	52,942	114,949
May	19,481	10,127	14,212	16,853	7,560	68,233	57,278	125,511
June	21,306	10,954	15,173	17,780	8,677	73,890	53,549	127,439
July	19,634	9,682	16,316	19,855	8,467	73,954	52,798	126,752
August	22,520	11,065	15,070	20,488	9,003	78,146	64,084	142,230
September	24,446	14,199	14,572	18,194	8,196	79,607	69,527	149,134
October	21,822	11,081	16,637	16,344	8,950	74,834	46,071	120,905
November	22,484	10,771	14,952	17,942	6,864	73,013	53,288	126,301
December	20,622	10,951	16,527	18,165	8,610	74,875	56,686	131,561
Total	243,597	124,487	172,007	201,546	96,124	837,761	670,878	1,508,639

[1] Compiled from reports of the National Gas Products Association and of producing companies not included in the association figures. Figures adjusted to agree with annual reports of individual producers.

Methods and Yields.—The over-all yield of carbon black from natural gas increased from 2.38 pounds per thousand cubic feet in 1949 to 2.57 in 1950. This increased yield was due partly to the increased production of furnace blacks from gas relative to the output of contact blacks and also to the higher yields of both furnace and contact blacks obtained from gas. The yield of contact black from gas continued its gradual rise, reaching 1.75 pounds per thousand cubic feet in 1950. The yield of furnace blacks produced from gas was 7.56 pounds per thousand cubic feet compared with 7.44 in 1949. Gas consumed in the manufacture of furnace blacks increased from 52 billion cubic feet in 1949 to 58 billion in 1950. Gas used for the production of contact blacks declined from 376 billion cubic feet in 1949 to 353 billion in 1950.

The yield of carbon black from liquid hydrocarbons in 1950 was 3.02 pounds per gallon. The consumption of liquid hydrocarbons in the production of furnace blacks increased by almost 50 percent in 1950, and the proportion of all furnace blacks produced from liquid feedstock increased from 35 percent in 1949 to 43 percent in 1950.

TABLE 5.—Natural gas and liquid hydrocarbons used in the manufacture of carbon black in the United States, and average yield, 1946–50

	1946	1947	1948	1949	1950
Natural gas used million cubic feet	478,349	484,882	480,646	427,892	410,852
Average yield of carbon black per thousand cubic feet pounds	2.44	2.51	2.41	2.38	2.57
Average value of natural gas used per thousand cubic feet cents	3.02	3.57	4.73	4.76	4.79
Liquid hydrocarbons used thousand gallons	[1] 20,000	[1] 31,000	44,551	72,387	107,707
Average yield of carbon black per gallon pounds	(2)	(2)	3.11	2.86	3.02
Number of producers reporting	22	21	24	[3] 20	20
Number of plants	60	63	63	[3] 63	53

[1] Estimated.
[2] Data not available.
[3] Revised figure.

Number and Capacity of Plants.—The number of carbon-black plants operating in 1950 was 53 — 35 contact-type plants and 18 furnace-type plants. Nine contact-type plants and one furnace-type plant that had been shut down in 1949 remained inactive in 1950. The one furnace-type plant shut down in 1949 was the General Atlas Carbon Co. plant, Texas County, Okla. The nine channel-type plants shut down in 1949 were: United Carbon Co., Grant County, Kans. (one plant), Ouachita Parish, La. (one plant), Hutchinson County, Tex. (three plants); Cabot Carbon Co., Texas County, Okla. (one plant), Hutchinson County, Tex. (one plant); and Columbian Carbon Co., Hutchinson County, Tex. (two plants). One channel-type plant of United Carbon Co. in Hutchinson County, Tex., which had been shut down in June 1949, was reopened in February 1950. A channel-type plant of Columbian Carbon Co. in Gray County, Tex., which had been shut down in 1949 was leased by Coltexo Corp. and reopened in 1950.

The daily capacity of operating plants in 1950 was 4,075,200 pounds. The daily capacity of furnace-type plants was 2,371,000 pounds, 89,800 pounds above the revised 1949 figure; the daily capacity of channel-type plants was 1,704,200 pounds, 170,600 pounds below the revised 1949 figure.

TABLE 6.—Number and capacity of carbon-black plants operated in the United States, 1949–50

State or district	County or parish	Number of plants: 1949 Contact	Number of plants: 1949 Furnace	Number of plants: 1950 Contact	Number of plants: 1950 Furnace	Total daily capacity (pounds): 1949	Total daily capacity (pounds): 1950
Texas:							
Panhandle district	Carson	[1]1		1		[2]1,926,800	1,768,100
	Gray	6	1	6	1		
	Hutchinson	[1]12	3	6	3		
	Moore	4	1	4	1		
Total Panhandle district		23	5	17	5	[2]1,926,800	1,768,100
Rest of State	Aransas	1	2	1	2	834,100	921,000
	Brazoria	1	[2]0	1			
	Brooks	1		1			
	Ector	1		1			
	Gaines	1		1			
	Harris		1		1		
	Montgomery		1		1		
	Nueces	1		1			
	Reagan	1		1			
	Terry		1		1		
	Ward	1		1			
	Winkler	1		1			
Total rest of State		9	[2]5	9	5	834,100	921,000
Total Texas		32	[2]10	26	10	[2]2,760,900	2,689,100
Louisiana	Avoyelles		1		1	584,700	618,700
	Evangeline		1		1		
	Ouachita	2	2	1	2		
	Richland	2		2			
Total Louisiana		4	4	3	4	584,700	618,700
California	Contra Costa		1		1	343,000	506,700
Kansas	Grant	2	2	1	2		
Oklahoma	Texas	1	2		1	205,000	
New Mexico	Lea	5		5		[2]262,400	260,700
Total United States		44	[2]19	35	18	[2]4,156,000	4,075,200

[1] 1 plant in both Carson and Hutchinson Counties tabulated with Hutchinson County.
[2] Revised figure.

Producers.—The number of producers remained at 20 in 1950. The Jefferson Lake Sulphur Co. had been classified as a producer in 1949, although it had no output and was merely liquidating stocks.

DEMAND—SALES

Domestic sales of carbon black in 1950 totaled 1,109 million pounds, an increase of 35 percent above 1949 and 11 percent above the previous peak year 1947. Exports increased 32 percent above 1949 to 400 million pounds, resulting in a total demand of 1,509 million pounds. Shipments of furnace blacks rose through the first three quarters of the year and declined in the fourth quarter. Shipments of contact blacks remained steady throughout the year, save for a sudden upsurge in August and September. Except during the last quarter, shipments of both contact and furnace grades exceeded production. Sales of furnace grades constituted 56 percent of total sales and 64 percent of domestic sales.

Sales to rubber companies increased 34 percent in 1950 and remained at 93 percent of total domestic carbon black sales. Domestic consumption of virgin rubber increased 26 percent while the ratio of

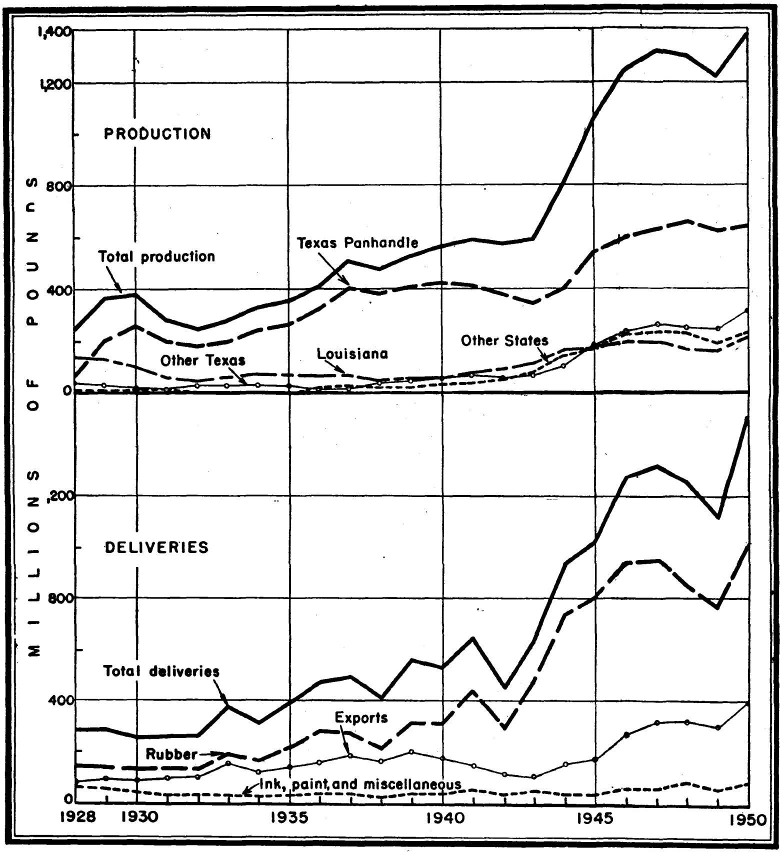

FIGURE 2.—Production and deliveries of carbon black, 1928–50. Production in "Other Texas" includes Oklahoma and Wyoming in 1932–35.

synthetic rubber to natural increased from 0.72 to 0.75. Allowing 105 million pounds for use in reclaim, indicated carbon-black loading of virgin rubber in 1950 was 741 pounds per long ton compared with 698 pounds in 1949.

Sales of carbon black to ink manufacturers increased 59 percent to 51 million pounds in 1950.

Sales of carbon black to the paint industry totaled 11 million pounds in 1950. This also was an increase of 59 percent and far ahead of the 20-percent over-all increase in sales by the paint industry.

TABLE 7.—Sales of carbon black for domestic consumption in the United States, by uses, 1946–50, in thousand pounds

Use	1946	1947	1948	1949	1950
Rubber	941, 464	943, 580	870, 564	767, 131	1, 030, 368
Ink	29, 561	32, 260	32, 436	32, 054	50, 903
Paint	9, 312	8, 137	6, 799	7, 005	11, 139
Miscellaneous	18, 318	16, 707	22, 634	15, 976	16, 661
Total	998, 655	1, 000, 684	932, 433	822, 166	1, 109, 071

STOCKS

Producers' stocks of furnace and channel blacks declined sharply through the first 9 months of 1950 and leveled off in the fourth quarter. Furnace-black stocks declined from 97 million pounds (58 days' supply) at the end of 1949 to 24 million pounds (10 days' supply) at the end of 1950. Stocks of contact blacks declined from 120 million pounds (75 days' supply) to 65 million pounds (36 days' supply) during 1950.

TABLE 8.—Producers' stocks of contact- and furnace-type blacks in the United States, Dec. 31, 1945–50, in thousand pounds

Year	Furnace						Contact	Total
	SRF	HMF	FEF	HAF	Other	Total		
1945	(1)	(1)	(1)	(1)	(1)	37,049	64,956	102,005
1946	(1)	(1)	(1)	(1)	(1)	59,222	17,006	76,228
1947	(1)	(1)	(1)	(1)	(1)	66,493	8,619	75,112
1948	(1)	(1)	(1)	(1)	(1)	90,597	27,646	118,243
1949	(1)	(1)	(1)	(1)	(1)	96,862	119,599	216,461
1950	5,275	5,035	4,622	7,831	1,438	24,201	65,342	89,543

[1] Data not available.

PRICES

The total value at plants of carbon black produced in the United States in 1950 was $84,604,000 compared with $74,685,000 in 1949. The average value of contact blacks remained essentially constant, declining 0.03 cent per pound to 7.19 cents per pound. The average value of furnace blacks continued to rise, increasing from 4.92 cents per pound in 1949 to 5.26 cents in 1950.

TABLE 9.—Prices of carbon black in carlots, f. o. b. plant, 1946–50, in cents per pound

[Oil, Paint and Drug Reporter]

Date of change	Channel blacks		Furnace blacks		
	Ordinary rubber grades [1]		Semireinforcing grades (SRF)	High-Modulus grades (HMF)	Fine grades (FF)
	Bags	Bulk	Bags	Bags	Bags
Jan. 1, 1946 [2]	5.25	5.00	3.50	5.00	
Oct. 1, 1946 [2]	5.75	5.50	3.50	5.00	
Jan. 1, 1947	6.32	6.00	3.50	5.00	6.00
Oct. 1, 1947	6.32	6.00	3.50	5.00	6.00
Jan. 1, 1948	6.82	6.50	3.50	5.00	6.50
Apr. 1, 1948	7.32	7.00	3.50	5.00	7.32
Jan. 7, 1949	7.40	7.00	3.50	5.00	7.40
July 1, 1949	6.90	6.50	3.50	5.00	7.40
Oct. 1, 1950	7.40	7.00	4.00	5.50	8.00

[1] Chiefly Easy-Processing (EPC) and Medium-Processing (MPC) but also includes Hard-Processing (HPC) and Conductive (CC) channel blacks.
[2] Office of Price Administration ceiling prices. Average realization on sales to the Rubber Reserve Company was generally higher.

The Oil, Paint and Drug Reporter quotes only one change in the market price of carbon blacks in 1950. On October 1, 1950, all grades listed advanced one-half cent per pound, except fine grades of furnace, which advanced 0.6 cent.

FOREIGN TRADE [1]

Imports.—Imports of "acetylene black" from Canada in 1950 totaled 9,911,197 pounds valued at 11.5 cents per pound. Other imports of "gas black or carbon black" were 48,350 pounds from Canada, 77 pounds from the Netherlands, and 2,920 pounds from Germany.

Exports.—There was a general upward trend to carbon-black exports through the first 9 months of the year, dropping off in the last quarter. For the year, exports increased 32 percent.

TABLE 10.—Carbon black exported from the United States, 1948–50, by countries of destination

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Argentina	5,764,671	$551,665	5,350,195	$496,501	14,253,880	$1,324,106
Australia	15,155,026	1,396,873	20,938,320	1,900,144	24,454,785	2,094,740
Austria	1,910,300	162,663	3,442,650	302,610	4,361,092	376,838
Belgium-Luxembourg	6,718,745	697,691	4,951,585	494,972	8,283,850	775,845
Brazil	8,810,209	816,433	13,674,097	1,200,202	21,978,247	1,868,528
Canada	51,620,189	3,094,028	43,912,566	2,682,604	56,206,788	3,560,771
Chile	1,434,215	124,624	1,566,437	154,671	1,249,451	108,847
China	825,659	88,428	90,575	8,564	224,650	29,650
Colombia	1,043,288	98,623	1,431,408	137,998	3,652,435	314,577
Cuba	272,240	24,225	419,950	34,130	1,138,950	89,126
Czechoslovakia	436,250	42,319	----------	----------	4,500	674
Denmark	2,925,915	293,939	680,550	78,022	1,190,050	121,700
Finland	1,098,350	104,155	672,300	60,507	972,225	82,636
France	46,481,544	4,219,264	[1] 53,874,361	[1] 5,065,762	52,392,925	4,646,839
Germany	1,416,100	135,742	1,772,564	187,865	778,725	76,616
Hong Kong	143,625	16,331	510,626	60,131	433,151	53,896
Hungary	367,250	35,911	(2)	(2)	----------	----------
India	12,988,382	1,213,755	6,626,800	541,896	11,242,092	966,132
Indonesia	1,982,276	187,290	2,242,654	188,869	3,463,300	311,076
Ireland	1,125,675	121,617	1,430,190	143,850	1,250,965	120,918
Italy	10,580,964	990,559	12,840,070	1,275,246	20,233,380	1,860,757
Japan	3,570,100	281,752	10,958,200	1,010,570	1,812,238	214,623
Korea	242,900	16,425	825,234	46,769	----------	----------
Malaya	144,250	13,982	358,750	32,646	794,023	72,798
Mexico	8,949,796	624,814	8,039,820	572,074	10,364,674	708,968
Netherlands	3,955,110	361,290	5,583,626	559,820	3,457,857	319,416
New Zealand	1,654,652	162,251	1,787,650	156,666	4,209,025	358,859
Norway	1,386,950	129,174	1,338,100	119,597	1,743,425	148,963
Pakistan	45,000	5,063	65,300	5,577	145,750	14,923
Peru	863,813	76,527	998,706	89,221	812,160	71,578
Portugal	394,650	41,618	982,950	90,629	1,354,650	126,257
Spain	4,314,850	412,207	2,029,550	188,526	1,989,600	173,583
Sweden	5,019,042	464,227	5,143,502	480,461	11,884,949	1,013,592
Switzerland	2,789,369	270,445	3,081,001	294,004	3,033,160	295,868
Turkey	497,600	38,626	599,250	45,168	925,700	70,873
Union of South Africa	11,208,660	1,013,913	12,019,829	1,121,695	16,723,450	1,455,811
United Kingdom	102,379,289	10,057,257	71,665,770	6,845,735	107,141,888	9,531,569
Uruguay	172,525	16,197	372,320	32,789	961,835	87,679
Venezuela	403,820	31,953	293,690	26,357	2,007,951	192,330
Yugoslavia	110,230	17,136	109,950	10,555	1,499,350	142,377
Other countries	711,100	72,523	563,125	56,554	940,375	94,292
Total	321,914,579	28,523,515	303,244,221	26,799,957	399,567,501	33,878,631

[1] Revised figure.
[2] Revised to zero.

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

The United Kingdom remained our largest export customer, followed by Canada and France. Exports increased considerably to the United Kingdom, Canada, Argentina, Brazil, Italy, and Sweden. Japan showed by far the greatest decline in carbon-black purchases from this country.

TABLE 11.—Contact- and furnace-type blacks exported from the United States in 1950, by months, in thousand pounds [1]

Month	Contact	Furnace	Total	Month	Contact	Furnace	Total
January	21,189	9,245	30,434	August	18,211	8,832	27,043
February	26,045	10,967	37,012	September	28,998	15,170	44,168
March	19,775	11,842	31,617	October	24,005	10,491	34,496
April	23,232	12,280	35,512	November	21,365	10,182	31,547
May	21,348	9,107	30,455	December	22,516	11,254	33,770
June	23,581	13,892	37,473				
July	16,329	9,712	26,041	Total	266,594	132,974	399,568

[1] From records of U. S. Department of Commerce.

TRENDS

The expanding pipeline demand for natural gas and the growing control that States are assuming over the field price of natural gas may progressively price natural gas out of a large segment of the carbon-black market. A number of channel plants have already shut down when their gas contracts expired. Blacks produced from liquid hydrocarbon feed are displacing the channel blacks. These oil-produced blacks are especially suitable for use with synthetic rubber but are even establishing acceptance for use with natural rubber stocks. Approximately 1 million pounds per day of oil-black producing capacity is in the planning stage or was under construction in the United States in 1951. A plant is also scheduled for construction at Sarnia, Ontario, in Canada. All these new carbon-black plants are to be located near petroleum refineries, their source of feedstock.

Cement

By Oliver S. North and Esther V. Balser

GENERAL SUMMARY

BOTH production, and apparent consumption as indicated by mill shipments, of cement in 1950 increased sharply over the preceding year's totals. Heavy demand for cement during the year resulted in a record-breaking output of 230,272,148 barrels of hydraulic cement—8 percent more than in 1949, the previous record year. The gains were reflected in both portland cement and the group "all other hydraulic cements." The output of the masonry, natural, and puzzolan group increased 33 percent over the 1949 total. The portland-cement industry operated at 84 percent and the remainder of the hydraulic cement industry at 96 percent of productive capacity during 1950. Mill shipments of portland cement (which totaled 227,756,636 barrels) represented an 11-percent increase over the 1949 total and set a new record. Shipments of other hydraulic cements increased 30 percent. Stocks of all hydraulic cements on hand at mills December 31, 1950, amounted to 13,217,036 barrels, 11 percent less than at the end of 1949.

The average net mill realization per barrel of portland cement reached $2.35—a 5-cent increase over the average 1949 price. Other hydraulic cements, as a group, reported a 4-cent gain per barrel to $2.52.

The long-term trend, as shown by the moving 12-month total of production of finished portland cement in the Bureau of Mines Monthly Cement Reports, continued the upward swing begun immediately after World War II and reached a new all-time high in December 1950.

Monthly production during 1950 totaled 15.2 million barrels in January, declined seasonably in February, increased steadily to a new record high in August, declined slightly in September, but again set a new record of 22,461,000 barrels in October. Production declined slightly in the next 2 months, although the totals were still remarkably high. The monthly average for the year exceeded 19 million barrels.

The pattern of monthly shipments from mills in 1950 was similar to that of 1949, but at a much higher level. A new record was reached in August, when total shipments exceeded 25 million barrels. Shipments totaled 9.6 million barrels in January, increased steadily through the next 5 months, declined in July, set a new high in August, declined in September, but increased again in October, before the usual November-December declines. December shipments amounted to 12.5 million barrels—7 percent above December 1949 shipments.

Through the first 3 months of 1950 stocks exceeded those of the same months in 1949, but during the rest of the year the peak demand for finished cement drove stocks on hand to lower totals. Finished-cement stocks at the end of January 1950 amounted to 20,275,000 barrels, and the maximum for the year was reached at the end of February. The year's low was reached in October, when 5,945,000 barrels were in stock.

Consumption trends of portland cement in 1950, as indicated in figure 1, continued to be essentially the same as in 1949. The Middle States were again the leading consuming area.

States in the regions shown in figure 1 are as follows: Northeastern—Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; Southern—Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; Middle—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; Rocky Mountain—Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming; and Pacific—California, Oregon, and Washington.

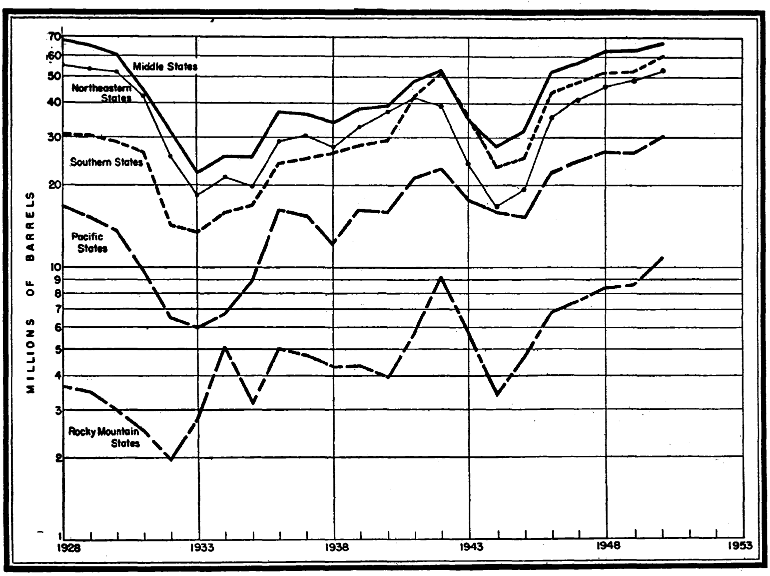

FIGURE 1.—Indicated consumption of portland cement in continental United States, 1928–50, by regions.

TABLE 1.—Salient statistics of the cement industry in the United States, 1946–50 [1]

	1946	1947	1948	1949	1950
Production:					
Portland..............barrels..	164,064,188	186,519,347	205,448,263	209,727,417	226,025,849
Masonry, natural, and puzzolan (slag-lime)......barrels..	2,474,674	2,951,098	3,440,248	3,185,229	4,246,299
Total................do....	166,538,862	189,470,445	208,888,511	212,912,646	230,272,148
Capacity used at portland-cement mills.......percent..	67.9	74.9	80.8	81.0	84.3
Shipments from mills:					
Total................barrels..	172,100,699	190,419,754	207,679,797	209,313,850	231,975,216
Value of shipments [2]............	$296,551,514	$361,978,374	$453,412,362	$481,183,393	$545,950,709
Average value per barrel.....	$1.72	$1.90	$2.18	$2.30	$2.35
Stocks at mills, Dec. 31...barrels..	11,081,786	10,157,015	11,303,591	[3] 14,920,104	13,217,036
Imports....................do....	3,734	4,606	282,752	109,821	1,394,015
Exports....................do....	5,163,362	[4] 6,771,250	5,922,163	4,561,899	2,418,435
Apparent consumption [5]....do....	166,941,071	[4] 183,454,387	202,040,386	204,861,772	230,950,796
World production (estimated) do....	425,089,000	500,726,000	595,125,000	671,934,000	771,024,000

[1] Figures include Puerto Rico and Hawaii, 1946; Puerto Rico only, 1947–50. There has been no production in Hawaii since 1946.
[2] Value received f. o. b. mill, excluding cost of containers.
[3] Revised figure.
[4] 198,723 barrels, valued at $839,916, shipped under the U. S. Army Civilian Supply Program, is excluded from exports shown but deducted from apparent consumption.
[5] Shipments from domestic mills minus net exports.

The program of expansion and improvement of various plants continued throughout 1950, and many companies were planning such programs for the future. Various factors have led the different companies to initiate expansion programs, the primary consideration being to attain an increased capacity as quickly as possible to serve the current high demand.

The new 4,000-barrel-per-day wet-process plant of the Halliburton Cement Co. at Corpus Christi, Tex., began operations in March 1950. New cement plants are being built in several key areas, some of which will serve the Southeast, where cement shortages have been acute and persistent. Four plants with a combined designed capacity of 18,000 barrels per day were nearing completion at the end of 1950. They were: The Baton Rouge, La., plant of the Ideal Cement Co., the Brandon, Miss., plant of the Marquette Cement Manufacturing Co., and the Roanoke, Va., and Sweetwater, Tex., dry-process plants of the Lone Star Cement Corp.

Senate Bill S. 1008—which would have authorized basing-point pricing—was vetoed by the President. This action was commented on by the trade press.[1]

The Portland Cement Association officially opened its new research and development laboratories, reported to be the largest and most completely equipped facilities in the world devoted exclusively to research on portland cement and concrete. They are near Chicago at Skokie, Ill.[2]

[1] Concrete, vol. 58, No. 7, July 1950, p. 36.
Engineering News-Record, vol. 124, No. 5, June 22, 1950, p. 25.
Oil, Paint and Drug Reporter, vol. 157, No. 26, June 26, 1950, p. 32.
Rock Products, vol. 53, No. 8, August 1950, p. 91.

[2] Nordberg, B., Portland Cement Association's New Research Laboratories: Rock Products, vol. 53, No. 6, June 1950, pp. 94–100.

PRODUCTION, SHIPMENTS, AND STOCKS

PORTLAND CEMENT

Portland cement, which constituted 98 percent of the entire output of hydraulic cements in 1950, was manufactured in 150 active plants in 36 States and Puerto Rico. One new plant in Texas began operating in March 1950, but production at one of the Pennsylvania plants ceased during the year.

Output in 1950 was greater than in 1949 in 18 of the 19 districts defined by the Bureau of Mines. The changes from 1949 figures ranged from a 3-percent decrease in Illinois to a 47-percent increase in Puerto Rico. The greatest increase in continental United States was made by the Rocky Mountain district (Colorado-Arizona-Wyoming-Montana-Utah-Idaho), whose production was up 24 percent. As usual, the Eastern Pennsylvania-Maryland district manufactured the greatest quantity—34,212,318 barrels—while California increased its output appreciably to 26,277,209 barrels. Nine districts reported an output exceeding 10 million barrels.

Shipments in 1950 were higher than in 1949 in all districts except Illinois, which reported a total 2 percent below that in the preceding year. Gains in continental United States ranged up to 28 percent for the Rocky Mountain district. Puerto Rico reported an increase of 47 percent.

Stocks of finished cement were 12 percent lower on December 31, 1950, than on the same date of the preceding year. Stocks were higher in 8 and lower in 11 districts, ranging from a 36-percent decrease in California to a 72-percent increase in Puerto Rico. The trend of month-end stocks of clinker followed the 1949 pattern through the first 7 months but dropped rapidly in the latter months, reaching a low for the year of less than 3 million barrels in October.

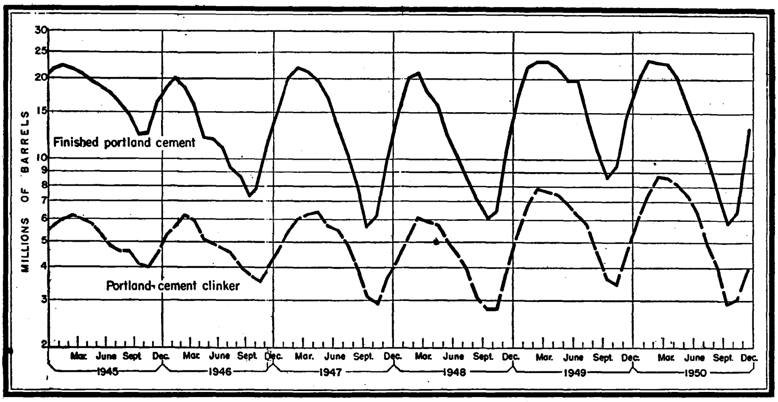

FIGURE 2.—End-of-month stocks of finished cement and portland-cement clinker, 1945–50

TABLE 2.—Finished portland cement produced, shipped, and in stock in the United States, 1949–50, by districts

District	Active plants 1949	Active plants 1950	Production: Barrels 1949	Production: Barrels 1950	Production: Percent change from 1949	Shipments from mills 1949: Barrels	Shipments 1949: Value Total	Shipments 1949: Value Average	Shipments from mills 1950: Barrels	Shipments 1950: Value Total	Shipments 1950: Value Average	Percent change from 1949 in — Barrels	Percent change from 1949 in — Average value	Stocks at mills on Dec. 31: Barrels 1949 [1]	Stocks: Barrels 1950	Stocks: Percent change from 1949
Eastern Pennsylvania, Maryland	21	21	33,799,369	34,212,318	+1.2	32,956,324	$75,344,266	$2.29	34,949,454	$83,442,830	$2.39	+6.0	+4.4	2,572,803	1,835,667	−28.7
New York, Maine	11	11	13,838,715	14,195,537	+2.6	13,737,319	31,009,863	2.26	14,398,689	33,600,329	2.33	+4.8	+3.1	1,072,900	869,748	−18.9
Ohio	9	9	10,313,496	10,606,739	+2.8	10,157,001	22,388,726	2.20	10,512,004	24,012,983	2.28	+3.5	+3.6	758,327	853,062	+12.5
Western Pennsylvania, West Virginia	7	7	8,930,125	9,381,631	+5.1	8,541,756	19,105,498	2.24	9,409,191	21,826,459	2.32	+10.2	+3.6	959,534	931,974	−2.9
Michigan	7	7	12,767,500	12,967,102	+1.6	12,747,791	28,823,055	2.26	12,854,423	29,619,766	2.30	+0.8	+1.8	1,204,467	1,317,146	+9.4
Ilinois	4	4	8,127,656	7,924,079	−2.5	7,976,972	16,645,730	2.09	7,857,969	16,920,234	2.15	−1.5	+2.9	629,380	695,490	+10.5
Indiana, Kentucky, Wisconsin	6	6	12,683,409	13,450,769	+6.1	12,433,483	25,566,156	2.06	13,525,250	29,354,637	2.17	+8.8	+5.3	1,011,800	937,319	−7.4
Alabama	7	7	9,721,542	10,371,834	+6.7	9,394,348	20,320,658	2.16	10,574,955	23,175,772	2.19	+12.6	+1.4	601,771	398,650	−33.8
Tennessee	6	6	6,077,549	6,684,644	+10.0	5,992,571	12,857,600	2.15	6,663,427	14,682,487	2.20	+11.2	+2.3	296,677	317,894	+7.2
Virginia, Georgia, Florida, Louisiana, South Carolina	7	7	8,505,552	9,410,357	+10.6	8,412,037	20,122,022	2.39	9,398,899	22,663,150	2.41	+11.7	+0.8	377,745	389,203	+3.0
Iowa	5	5	6,834,445	7,415,625	+8.5	6,655,208	14,602,554	2.19	7,231,807	16,157,979	2.23	+8.7	+1.8	652,955	836,773	+28.2
Eastern Missouri, Minnesota, South Dakota	6	6	9,867,811	11,409,363	+15.6	9,452,303	21,601,203	2.29	11,389,872	26,598,857	2.34	+20.5	+2.2	892,986	912,477	+2.2
Kansas	6	6	7,824,620	8,616,357	+10.1	7,640,540	16,880,156	2.21	8,759,103	19,400,068	2.21	+14.6		455,879	313,133	−31.3
Western Missouri, Nebraska, Oklahoma, Arkansas	6	6	7,412,145	8,193,685	+10.5	7,403,827	16,418,363	2.22	8,239,959	18,635,573	2.26	+11.3	+1.8	388,938	342,664	−11.9
Texas	10	11	14,949,812	17,150,293	+14.7	14,741,805	33,409,347	2.27	17,281,521	39,677,804	2.30	+17.2	+1.3	637,255	506,027	−20.6
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	10	9	6,261,861	7,737,195	+23.6	6,149,542	17,227,366	2.80	7,886,861	22,628,743	2.87	+28.3	+2.5	494,874	345,208	−30.2
California	11	11	23,218,356	26,277,209	+13.2	23,201,982	57,464,213	2.48	26,685,004	65,258,675	2.45	+15.0	−1.2	1,127,287	719,492	−36.2
Oregon, Washington	9	9	6,401,510	6,802,763	+6.3	6,314,030	17,281,215	2.74	6,950,797	19,365,591	2.79	+10.1	+1.8	580,019	431,985	−25.5
Puerto Rico	2	2	2,191,944	3,218,349	+46.8	2,171,486	6,109,041	2.81	3,187,451	8,299,186	2.60	+46.8	−7.5	42,902	73,800	+72.0
Total	150	150	209,727,417	226,025,849	+7.8	206,080,325	473,177,032	2.30	227,756,636	535,321,123	2.35	+10.5	+2.2	14,758,499	13,027,712	−11.7
Pennsylvania	24	24	38,122,065	38,646,260	+1.4	36,905,254	84,839,175	2.30	39,450,611	94,604,230	2.40	+6.9	+4.3	3,275,594	2,471,243	−24.6
Missouri	5	5	8,791,943	9,777,855	+11.2	8,518,636	19,347,814	2.27	9,779,657	22,751,226	2.33	+14.8	+2.6	731,775	729,973	−.2

[1] Revised figures.

TABLE 3.—Production, shipments from mills, and stocks at mills of finished portland cement in the United States in 1950, by months and districts, in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December
PRODUCTION												
Eastern Pennsylvania, Maryland	2,599	2,257	2,103	2,819	3,049	2,996	2,838	3,089	3,064	3,319	3,001	3,038
New York, Maine	877	809	800	1,133	1,387	1,267	1,137	1,409	1,331	1,451	1,411	1,174
Ohio	736	675	761	840	922	928	1,055	875	846	1,161	1,004	801
Western Pennsylvania, West Virginia	580	494	608	641	738	770	874	1,004	958	1,000	878	838
Michigan	598	551	274	992	1,351	1,289	1,332	1,556	1,340	1,450	1,250	984
Illinois	527	300	358	585	664	732	831	821	807	831	761	711
Indiana, Kentucky, Wisconsin	865	655	611	1,091	1,318	1,206	1,400	1,466	1,307	1,380	1,118	1,034
Alabama	787	685	731	853	912	939	913	907	899	952	873	923
Tennessee	506	440	526	580	539	530	551	592	605	641	590	583
Virginia, Georgia, Florida, Louisiana, South Carolina	727	686	772	809	819	780	812	837	707	819	808	836
Iowa	601	409	283	540	543	584	657	854	741	876	681	659
Eastern Missouri, Minnesota, South Dakota	663	518	711	729	851	1,142	1,238	1,183	1,125	1,216	1,094	953
Kansas	690	518	579	761	729	809	777	754	780	778	758	686
Western Missouri, Nebraska, Oklahoma, Arkansas	646	544	517	683	698	719	743	710	744	787	712	691
Texas	1,221	1,165	1,430	1,436	1,485	1,397	1,507	1,521	1,487	1,533	1,464	1,503
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	380	314	451	687	808	703	725	790	782	770	701	627
California	1,797	1,653	2,109	2,197	2,269	2,298	2,372	2,388	2,328	2,436	2,231	2,233
Oregon, Washington	191	228	420	523	621	663	687	798	780	727	609	549
Puerto Rico	211	214	257	235	238	249	260	330	314	334	282	293
United States: 1950	15,202	13,115	14,301	18,134	19,941	20,001	20,709	21,884	20,945	22,461	20,226	19,116
1949	15,261	13,751	15,439	17,682	18,622	18,279	18,856	18,715	19,181	19,070	18,040	16,967
SHIPMENTS												
Eastern Pennsylvania, Maryland	1,811	1,192	2,033	3,074	3,522	3,975	3,583	3,740	3,314	3,674	3,187	1,849
New York, Maine	532	370	635	1,246	1,644	1,740	1,450	1,612	1,476	1,567	1,475	654
Ohio	378	342	535	803	1,195	1,350	1,226	1,135	997	1,374	875	301
Western Pennsylvania, West Virginia	381	313	461	684	840	1,101	1,077	1,165	1,109	1,147	813	321
Michigan	330	319	422	716	1,507	1,736	1,475	1,746	1,520	1,575	1,067	440
Illinois	149	191	314	521	842	995	977	1,129	943	912	676	213
Indiana, Kentucky, Wisconsin	375	445	740	980	1,506	1,567	1,667	1,650	1,453	1,537	1,155	450
Alabama	659	697	782	933	1,049	1,016	909	920	945	958	898	808
Tennessee	457	492	618	586	551	503	517	646	626	645	598	425
Virginia, Georgia, Florida, Louisiana, South Carolina	681	632	732	854	926	830	799	872	715	812	819	728
Iowa	116	156	325	568	876	973	804	955	866	912	518	163
Eastern Missouri, Minnesota, South Dakota	183	277	485	804	1,097	1,470	1,439	1,453	1,356	1,395	970	461
Kansas	273	401	748	902	908	846	767	827	867	865	831	525
Western Missouri, Nebraska, Oklahoma, Arkansas	266	408	650	747	826	898	737	882	748	832	746	500

TABLE 3.—Production, shipments from mills, and stocks at mills of finished portland cement in the United States in 1950, by months and districts, in thousands of barrels—Continued

District	January	February	March	April	May	June	July	August	September	October	November	December
SHIPMENTS—continued												
Texas	1,124	1,200	1,565	1,379	1,460	1,438	1,499	1,625	1,517	1,567	1,492	1,419
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	202	321	528	692	737	795	861	912	878	815	690	457
California	1,476	1,654	2,368	2,181	2,393	2,577	2,347	2,614	2,368	2,444	2,188	2,095
Oregon, Washington	49	199	452	538	707	720	772	925	887	799	523	374
Puerto Rico	190	215	276	216	248	219	261	336	325	337	270	294
United States: 1950	9,632	9,824	14,669	18,424	22,834	24,749	23,167	25,144	22,910	24,167	19,791	12,477
1949	8,756	9,134	14,539	17,779	19,426	20,667	19,321	23,633	22,763	21,278	17,269	11,628
STOCKS (END OF MONTH)												
Eastern Pennsylvania, Maryland	3,360	4,428	4,501	4,259	3,796	2,819	2,076	1,431	1,184	832	648	1,837
New York, Maine	1,458	1,896	2,058	1,943	1,682	1,206	898	694	531	413	349	868
Ohio	1,114	1,448	1,674	1,712	1,438	1,017	846	587	436	224	353	853
Western Pennsylvania, West Virginia	1,160	1,341	1,489	1,445	1,344	1,013	810	648	497	350	415	933
Michigan	1,473	1,705	1,556	1,832	1,676	1,229	1,086	895	715	591	773	1,317
Illinois	1,007	1,115	1,159	1,224	1,046	782	636	329	193	112	197	695
Indiana, Kentucky, Wisconsin	1,498	1,707	1,579	1,690	1,503	1,142	876	692	547	390	354	937
Alabama	730	718	667	587	450	373	377	364	316	309	284	399
Tennessee	346	294	202	197	184	211	246	193	172	168	160	318
Virginia, Georgia, Florida, Louisiana, South Carolina	424	478	518	472	366	315	327	292	283	291	280	389
Iowa	1,138	1,392	1,350	1,321	988	599	452	350	225	189	341	837
Eastern Missouri, Minnesota, South Dakota	1,373	1,614	1,841	1,767	1,520	1,182	981	710	476	295	419	911
Kansas	873	990	820	678	499	463	473	400	313	225	152	313
Western Missouri, Nebraska, Oklahoma, Arkansas	769	904	772	707	579	401	406	231	231	186	152	343
Texas	734	699	564	621	645	606	615	511	481	447	419	504
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	673	666	589	584	656	564	427	306	210	165	176	345
California	1,366	1,380	1,121	1,137	1,013	734	759	552	526	527	582	720
Oregon, Washington	715	745	712	697	611	559	474	347	240	167	253	428
Puerto Rico	64	63	44	63	54	83	83	76	66	64	75	74
United States: 1950	20,275	23,583	23,216	22,936	20,050	15,298	12,848	9,608	7,642	5,945	6,382	13,021
1949	17,591	22,206	23,104	22,977	22,170	19,785	19,313	14,381	10,797	8,569	9,352	[1] 14,706

[1] Revised figure.

TABLE 4.—Stocks of finished portland cement and portland-cement clinker at mills in the United States [1] on Dec. 31, and yearly range in end-of-month stocks, 1946–50

	Dec. 31 (barrels)	Range			
		Low		High	
		Month	Barrels	Month	Barrels
1946—Cement	10,969,755	October	7,298,000	February	20,034,000
Clinker	3,886,443	November	3,512,000	March	6,281,000
1947—Cement	10,011,607	October	5,668,000	do	22,178,000
Clinker	3,605,299	November	2,929,000	May	6,353,000
1948—Cement	11,093,690	October	6,094,000	March	20,886,000
Clinker	3,781,250	November	2,781,000	do	6,072,000
1949—Cement	[2] 14,758,499	October	8,569,000	do	23,104,000
Clinker	[2] 4,586,746	November	3,387,000	do	7,764,000
1950—Cement	13,027,712	October	5,945,000	February	23,583,000
Clinker	3,901,830	do	2,852,000	March	8,821,000

[1] Includes Puerto Rico and Hawaii, 1946; Puerto Rico only, 1947-50. There has been no production in Hawaii since 1946.
[2] Revised figure.

NATURAL, MASONRY (NATURAL), AND PUZZOLAN CEMENTS

Hydraulic cements, other than portland, were produced in nine plants in 1950. Output, shipments, and stocks during the year were, respectively, 33, 30, and 17 percent greater than in 1949. Producers of this group reported the consumption of 56,555 short tons of coal and 248,215,000 cubic feet of gas (equivalent to approximately 5,191 short tons of coal).

TABLE 5.—Natural, masonry (natural), and puzzolan (slag-lime) cements, produced, shipped, and in stock at mills in the United States, 1946–50

Year	Production		Shipments		Stocks on Dec. 31 (barrels of 376 pounds)
	Active plants	Barrels (376 pounds)	Barrels (376 pounds)	Value	
1946	9	2,474,674	2,533,106	$4,155,171	112,031
1947	9	2,951,098	2,927,885	5,764,398	145,408
1948	9	3,440,248	3,375,135	7,734,289	209,901
1949	9	3,185,229	3,233,525	8,006,361	161,605
1950	9	4,246,299	4,218,580	10,629,586	189,324

TYPES OF CEMENT

A breakdown of the total production of portland cement by various types for the 1946–50 period is shown in table 6. The output and shipments of all of the types, except type V, sulfate-resisting, were higher than in 1949. Marked percentage increases were noted for low-heat, portland-puzzolan, and high-early-strength cements.

Prepared Masonry Mortars.—Production of these mixed materials was reported by 99 plants in 1950 and totaled 11,199,099 barrels. Shipments reached 11,476,224 barrels valued at $32,581,066, an average mill value of $2.84 per barrel. These data are not included in the statistical tabulations in this chapter, but the portland cement used in manufacturing these mixtures is included.

TABLE 6.—Portland cement produced and shipped in the United States,[1] 1946–50, by types

Type and year	Active plants	Production (barrels)	Shipments		
			Barrels	Value	
				Total	Average
General use and moderate heat (types I and II):					
1946	153	139, 173, 936	144, 038, 503	$244, 051, 517	$1. 69
1947	150	157, 525, 464	158, 637, 287	297, 619, 024	1. 88
1948	150	174, 909, 904	173, 365, 414	374, 584, 386	2. 16
1949	150	177, 597, 585	174, 569, 746	396, 817, 234	2. 27
1950	150	191, 994, 091	193, 693, 533	449, 842, 513	2. 32
High-early-strength (type III):					
1946	105	6, 716, 488	7, 183, 209	14, 977, 117	2. 09
1947	87	6, 015, 985	5, 899, 830	13, 284, 390	2. 25
1948	87	5, 513, 312	5, 615, 894	14, 224, 177	2. 53
1949	87	5, 979, 435	5, 649, 482	15, 047, 036	2. 66
1950	90	6, 667, 974	6, 607, 172	18, 094, 386	2. 74
Low-heat (type IV):					
1946	3	139, 996	136, 541	248, 057	1. 82
1947	5	125, 113	137, 469	252, 721	1. 84
1948	3	135, 871	153, 994	306, 962	1. 99
1949	6	159, 739	129, 411	329, 284	2. 54
1950	5	328, 879	271, 559	682, 008	2. 51
Sulfate-resisting (type V):					
1946	4	65, 880	60, 950	125, 204	2. 05
1947	5	64, 126	94, 455	231, 523	2. 45
1948	6	204, 862	163, 127	505, 710	3. 10
1949	5	95, 023	113, 370	472, 016	4. 16
1950	4	4, 070	49, 152	141, 888	2. 89
Oil-well:					
1946	17	1, 510, 843	1, 568, 881	3, 110, 351	1. 98
1947	18	1, 701, 305	1, 708, 719	3, 592, 577	2. 10
1948	14	1, 817, 746	1, 966, 854	4, 972, 499	2. 53
1949	17	1, 714, 938	1, 745, 908	4, 554, 603	2. 61
1950	17	1, 829, 651	1, 830, 167	4, 735, 423	2. 59
White:					
1946	5	774, 215	797, 194	3, 299, 200	4. 14
1947	4	855, 323	837, 489	3, 762, 417	4. 49
1948	4	1, 034, 500	1, 005, 356	4, 510, 169	4. 49
1949	4	1, 071, 100	1, 031, 408	4, 985, 107	4. 83
1950	5	1, 175, 490	1, 187, 202	5, 637, 101	4. 75
Portland-puzzolan:					
1946	5	1, 092, 607	1, 091, 854	1, 696, 870	1. 55
1947	5	1, 519, 961	1, 529, 551	2, 970, 919	1. 94
1948	6	1, 545, 584	1, 693, 207	3, 733, 436	2. 20
1949	4	1, 080, 848	1, 147, 694	2, 602, 853	2. 27
1950	5	1, 369, 764	1, 321, 223	3, 232, 282	2. 45
Air-entrained:					
1946	69	13, 765, 384	13, 850, 983	23, 173, 284	1. 67
1947	73	17, 850, 165	17, 768, 010	32, 359, 835	1. 82
1948	73	19, 421, 610	19, 453, 359	40, 322, 716	2. 07
1949	78	21, 266, 590	20, 940, 562	46, 091, 687	2. 20
1950	80	21, 717, 585	21, 860, 316	50, 107, 196	2. 29
Miscellaneous:[2]					
1946	21	824, 839	839, 478	1, 714, 743	2. 04
1947	20	861, 905	879, 059	2, 140, 570	2. 44
1948	20	864, 874	887, 457	2, 518, 018	2. 84
1949	24	762, 159	752, 744	2, 277, 212	3. 03
1950	24	938, 345	936, 312	2, 848, 326	3. 04
Grand total:					
1946	153	164, 064, 188	169, 567, 593	292, 396, 343	1. 72
1947	150	186, 519, 347	187, 491, 869	356, 213, 976	1. 90
1948	150	205, 448, 263	204, 304, 662	445, 678, 073	2. 18
1949	150	209, 727, 417	206, 080, 325	473, 177, 032	2. 30
1950	150	226, 025, 849	227, 756, 636	535, 321, 123	2. 35

[1] Including Puerto Rico and Hawaii, 1946; Puerto Rico only, 1947–50. There has been no production in Hawaii since 1946.
[2] Includes hydroplastic, plastic, and waterproofed cements.

CAPACITY OF PLANTS

The total estimated annual capacity of all portland-cement plants in 1950, as reported to the Bureau of Mines by producers, increased 4 percent over that reported in 1949.

The over-all rate of operation in 1950 was 84 percent of the total capacity—3 percent greater than in 1949. As table 7 indicates, the percentage of capacity utilized rose in 13 and decreased in 5 districts, with 1 remaining unchanged. In continental United States the percentage changes ranged from a 4-percent decrease in the Iowa district to a 12-percent increase in the Colorado-Arizona-Wyoming-Montana-Utah-Idaho district. A 23-percent increase was recorded in the Puerto Rico district. The percentage of capacity utilized in each month of 1950 was lower during the first quarter than in 1949, but from May to the end of the year the 1950 percentages were markedly higher, attaining a peak figure of 102 percent in October. Production in November and December remained quite high.

TABLE 7.—Portland-cement-manufacturing capacity of the United States, 1949–50, by districts

District	Estimated capacity (barrels)		Percent of capacity utilized	
	1949	1950	1949	1950
Eastern Pennsylvania, Maryland	38,403,325	38,916,493	88.0	87.9
New York, Maine	17,398,048	17,084,962	79.5	83.1
Ohio	12,952,515	12,994,125	79.6	81.6
Western Pennsylvania, West Virginia	14,961,300	14,971,300	59.7	62.7
Michigan	15,394,776	15,793,782	82.9	82.1
Illinois	9,524,510	9,460,680	85.3	83.8
Indiana, Kentucky, Wisconsin	17,824,000	17,929,470	71.2	75.0
Alabama	10,967,660	11,365,650	88.6	91.3
Tennessee	7,322,000	8,072,000	83.0	82.8
Virginia, Georgia, Florida, Louisiana, South Carolina	9,740,000	10,361,248	87.3	90.8
Iowa	7,830,000	8,953,515	87.3	82.8
Eastern Missouri, Minnesota, South Dakota	11,387,265	13,156,720	86.7	86.7
Kansas	9,407,000	9,465,385	83.2	91.0
Western Missouri, Nebraska, Oklahoma, Arkansas	8,600,000	8,786,759	86.2	93.3
Texas	16,596,000	18,656,000	90.1	91.9
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	9,010,000	9,490,000	69.5	81.5
California	29,870,000	30,870,000	77.7	85.1
Oregon, Washington	8,130,000	8,095,216	78.7	84.0
Puerto Rico	3,630,000	3,850,000	60.4	83.6
Total	258,948,399	268,273,305	81.0	84.3

TABLE 8.—Percentage of capacity used in the finished portland-cement industry in the United States, 1949–50

Month	Monthly		12 months ended—		Month	Monthly		12 months ended—	
	1949	1950	1949	1950		1949	1950	1949	1950
January	73	70	84	82	July	87	94	83	82
February	73	67	84	82	August	87	99	83	83
March	74	66	85	81	September	92	98	83	84
April	85	85	82	80	October	88	102	83	85
May	86	90	83	81	November	86	95	83	86
June	87	93	83	81	December	78	87	82	87

The total capacity of both wet- and dry-process plants, as indicated in table 9, continued to increase. Wet-process plants now constitute nearly 55 percent of the total productive capacity. The percentage of cement produced by wet-process plants in 1950 continued its trend of recent years by gaining slightly.

TABLE 9.—Capacity of portland-cement plants in the United States,[1] 1948–50, by processes

Process	Capacity: Thousands of barrels			Capacity: Percent of total			Percent of capacity utilized			Percent of total finished cement produced		
	1948	1949	1950	1948	1949	1950	1948	1949	1950	1948	1949	1950
Wet	136,588	139,169	147,049	53.7	53.7	54.8	81.4	83.7	86.6	54.1	55.6	56.3
Dry	117,684	119,779	121,224	46.3	46.3	45.2	80.1	77.8	81.4	45.9	44.4	43.7
Total	254,272	258,948	268,273	100.0	100.0	100.0	80.8	81.0	84.3	100.0	100.0	100.0

[1] Includes Puerto Rico. There is currently no production in Hawaii.

A grouping of the cement plants based on their annual capacity is shown below. Plant improvements and kiln additions resulted in gains of one plant and two plants, respectively, for the 2,000,000–3,000,000-barrel-capacity and the 3,000,000–10,000,000-barrel-capacity groups. The less-than-1,000,000-barrel-capacity and the 1,000,000–2,000,000-barrel-capacity groups decreased one plant and two plants, respectively.

Number of portland-cement plants in the United States (including Puerto Rico), by size groups, in 1950

Estimated annual capacity, barrels:	*Number of plants*
Less than 1,000,000	25
1,000,000 to 2,000,000	85
2,000,000 to 3,000,000	29
3,000,000 to 10,000,000	13
Total	152

CLINKER PRODUCTION

The output of clinker—the intermediate product between raw materials and the finished cement—was 7 percent greater in 1950 than in 1949. Peak production was attained in October, while stocks reached their greatest accumulation in March. During the later months of 1950, month-end stocks were considerably lower than in the corresponding months of the preceding year. Stocks of clinker on December 31, 1950, were 15 percent lower than those reported at the end of 1949.

TABLE 10.—Production of stocks of portland-cement clinker at mills in the United States in 1950, by months and districts, in thousands of barrels

District	January	February	March	April	May	June	July	August	September	October	November	December
PRODUCTION												
Eastern Pennsylvania, Maryland	2,740	2,316	2,194	3,048	3,082	2,980	2,678	2,980	3,018	3,236	3,072	3,083
New York, Maine	1,030	903	1,005	1,147	1,293	1,180	1,107	1,308	1,273	1,273	1,260	1,246
Ohio	814	692	845	879	875	962	966	888	815	1,095	1,022	922
Western Pennsylvania, West Virginia	595	480	655	590	735	775	872	930	875	951	869	882
Michigan	1,027	939	775	862	1,346	1,231	1,197	1,259	1,198	1,307	1,253	1,174
Illinois	659	437	491	639	616	697	661	764	744	746	761	726
Indiana, Kentucky, Wisconsin	924	817	872	1,062	1,190	1,231	1,274	1,273	1,261	1,301	1,158	1,195
Alabama	817	716	736	854	954	928	903	873	929	940	910	900
Tennessee	474	465	578	606	604	498	579	606	578	599	617	568
Virginia, Georgia, Florida, Louisiana, South Carolina	756	721	800	798	824	791	831	841	728	860	830	865
Iowa	589	465	343	491	604	607	670	724	687	803	705	687
Eastern Missouri, Minnesota, South Dakota	750	650	712	779	846	986	1,092	1,127	1,102	1,114	1,093	1,011
Kansas	654	527	623	729	772	764	789	780	770	799	733	750
Western Missouri, Nebraska, Oklahoma, Arkansas	638	572	536	674	712	711	709	712	683	729	708	715
Texas	1,210	1,181	1,436	1,444	1,472	1,426	1,496	1,523	1,497	1,535	1,471	1,510
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	521	409	452	718	733	664	666	710	704	748	718	735
California	2,094	1,717	2,038	1,986	2,152	2,236	2,389	2,292	2,334	2,396	2,255	2,301
Oregon, Washington	355	308	394	604	598	504	621	666	683	674	650	604
Puerto Rico	211	193	255	231	219	224	267	312	298	325	309	306
United States: 1950	16,858	14,508	15,740	18,141	19,627	19,395	19,767	20,568	20,177	21,431	20,394	20,180
1949	17,004	15,133	16,600	17,442	18,609	17,917	18,230	18,362	18,000	18,249	17,854	18,320
STOCKS (END OF MONTH)												
Eastern Pennsylvania, Maryland	769	798	895	1,023	1,018	966	850	664	528	345	383	422
New York, Maine	431	522	739	769	697	637	613	526	489	342	229	295
Ohio	258	263	355	374	314	322	231	223	186	107	124	234
Western Pennsylvania, West Virginia	224	240	294	250	260	241	261	209	162	144	161	229
Michigan	651	1,021	1,512	1,355	1,290	1,159	952	622	423	229	167	339
Illinois	223	355	484	530	473	427	250	188	119	26	12	25
Indiana, Kentucky, Wisconsin	368	526	749	720	586	571	436	244	194	114	149	285
Alabama	183	201	192	169	182	153	139	91	110	81	105	64
Tennessee	93	105	150	164	211	168	180	175	143	91	107	82

TABLE 10.—Production and stocks of portland-cement clinker at mills in the United States in 1950, by months and districts, in thousands of barrels—Continued

District	January	February	March	April	May	June	July	August	September	October	November	December
STOCKS (END OF MONTH)—continued												
Virginia, Georgia, Florida, Louisiana, South Carolina	70	92	111	86	74	73	79	68	74	85	88	93
Iowa	241	280	329	285	342	358	373	234	174	98	103	138
Eastern Missouri, Minnesota, South Dakota	279	416	428	500	502	379	257	218	212	123	138	216
Kansas	72	70	98	64	101	62	65	79	75	94	66	95
Western Missouri, Nebraska, Oklahoma, Arkansas	91	128	137	145	153	153	126	121	68	26	29	61
Texas	75	91	79	63	69	93	72	73	78	71	74	72
Colorado, Arizona, Wyoming, Montana, Utah, Idaho	373	463	477	463	362	320	274	163	83	68	83	175
California	1,201	1,276	1,199	976	843	774	780	675	681	622	666	713
Oregon, Washington	489	569	548	641	628	468	411	293	201	153	205	265
Puerto Rico	50	38	45	49	37	22	39	34	29	33	73	99
United States: 1950	6,141	7,454	8,821	8,626	8,142	7,346	6,388	4,900	4,029	2,852	2,962	3,902
1949	5,475	6,752	7,764	7,560	7,440	6,922	6,212	5,798	4,461	3,610	3,387	[1] 4,587

[1] Revised figure.

TABLE 11.—Portland-cement clinker produced and in stock at mills in the United States,[1] 1949–50, by processes, in barrels of 376 pounds [2]

Process	Plants		Production		Stocks on Dec. 31—	
	1949	1950	1949	1950	1949 [3]	1950 [4]
Wet	88	89	117,106,285	127,062,394	2,221,600	1,939,017
Dry	62	61	94,613,974	99,723,358	2,365,146	1,962,813
Total	150	150	211,720,259	226,785,752	4,586,746	3,901,830

[1] Including Puerto Rico. There was no production in Hawaii.
[2] Compiled from monthly estimates of producers.
[3] Revised figures.
[4] Preliminary figures.

RAW MATERIALS

Among the raw materials used for manufacturing cement, the "limestone and clay or shale" classification represented 73 percent of the total output in 1950—a gain of 1 percent compared to 1949. "Cement rock and pure limestone" were the materials used in manufacturing 21 percent of the total—1 percent less than in 1949. The percentage made from "blast-furnace slag and limestone" varied only slightly from 1949 and amounted to 5 percent of the output. The use of "marl and clay" declined fractionally and now represents only 1 percent of the output.

TABLE 12.—Production and percentage of total output of portland cement in the United States,[1] 1902–14, 1926, 1929, 1933, 1935, and 1941–50, by raw materials used

Year	Cement rock and pure limestone		Limestone and clay or shale [2]		Marl and clay		Blast-furnace slag and limestone	
	Barrels	Percent	Barrels	Percent	Barrels	Percent	Barrels	Percent
1902	10,953,178	63.6	3,738,303	21.7	2,220,453	12.9	318,710	1.8
1903	12,493,694	55.9	6,333,403	28.3	3,052,946	13.7	462,930	2.1
1904	15,173,391	57.2	7,526,323	28.4	3,332,873	12.6	473,294	1.8
1905	18,454,902	52.4	11,172,389	31.7	3,884,178	11.0	1,735,343	4.9
1906	23,896,951	51.4	16,532,212	35.6	3,958,201	8.5	2,076,000	4.5
1907	25,859,095	53.0	17,190,697	35.2	3,606,598	7.4	2,129,000	4.4
1908	20,678,693	40.6	23,047,707	45.0	2,811,212	5.5	4,535,300	8.9
1909	24,274,047	37.3	32,219,365	49.6	2,711,219	4.2	5,786,800	8.9
1910	26,520,911	34.6	39,720,320	51.9	3,307,220	4.3	7,001,500	9.2
1911	26,812,129	34.1	40,665,332	51.8	3,314,176	4.2	7,737,000	9.9
1912	24,712,780	30.0	44,607,776	54.1	2,467,368	3.0	10,650,172	12.9
1913	29,333,490	31.8	47,831,863	51.9	3,734,778	4.1	11,197,000	12.2
1914	24,907,047	28.2	50,168,813	56.9	4,038,310	4.6	9,116,000	10.3
1926	44,090,657	26.8	101,637,866	61.8	3,324,408	2.0	15,477,239	9.4
1929	51,077,034	29.9	97,623,502	57.2	4,832,700	2.9	17,112,800	10.0
1933	14,135,171	22.3	43,638,023	68.7	1,402,744	2.2	4,297,251	6.8
1935	23,811,687	31.0	45,073,144	58.8	1,478,569	1.9	6,378,170	8.3
1941	46,534,193	28.4	102,285,699	62.3	3,142,021	1.9	12,068,646	7.4
1942	49,479,304	27.0	115,948,373	63.4	3,009,562	1.7	14,343,945	7.9
1943	29,915,157	22.4	92,310,018	69.2	2,300,636	1.7	8,897,977	6.7
1944	17,609,055	19.4	65,478,178	72.0	2,078,530	2.3	5,739,933	6.3
1945	20,383,505	19.8	73,409,831	71.4	2,035,236	2.0	6,976,312	6.8
1946	39,070,643	23.8	112,142,154	68.3	2,720,500	1.7	10,130,891	6.2
1947	43,428,201	23.3	129,338,247	69.3	2,408,845	1.3	11,344,054	6.1
1948	47,559,783	23.1	144,855,487	70.5	2,620,060	1.3	10,412,933	5.1
1949	45,655,516	21.8	150,435,948	71.7	3,310,270	1.6	10,325,683	4.9
1950	47,120,142	20.8	164,811,547	73.0	2,596,962	1.1	11,497,198	5.1

[1] Includes Puerto Rico, 1941–50; Hawaii, 1945–46. There has been no production in Hawaii since 1946.
[2] Includes output of 2 plants using oystershells and clay in 1926; 3 plants in 1929, 1933, and 1935; 4 plants in 1941–45; 5 plants in 1946–49; and 6 plants in 1950.

The tonnages of raw materials (exclusive of fuel and explosives) required to produce portland cement in recent years are given in table 13. Limestone, cement rock, and clay and shale constitute 94 percent of the total materials consumed in 1950. Except for marl, which decreased 11 percent, all types of raw material consumed showed gains over the amounts consumed in 1949. The quantity of limestone and oystershells used increased over 4 million tons.

TABLE 13.—Raw materials used in producing portland cement in the United States,[1] 1948–50

Raw material	1948	1949	1950
	Short tons	*Short tons*	*Short tons*
Cement rock	13,046,856	12,628,494	12,981,679
Limestone (including oystershells)	43,489,837	44,968,739	49,035,439
Marl	601,716	722,606	640,462
Clay and shale [2]	6,440,584	6,698,408	7,169,015
Blast-furnace slag	896,474	847,375	971,125
Gypsum	1,507,876	1,543,198	1,660,466
Sand and sandstone (including silica and quartz)	723,769	724,624	769,806
Iron materials [3]	318,106	346,542	379,637
Miscellaneous [4]	133,716	140,999	148,290
Total	67,158,934	68,620,985	73,755,919
	Pounds	*Pounds*	*Pounds*
Average total weight required per barrel (376 pounds) of finished cement	654	654	653

[1] Including Puerto Rico. There was no production in Hawaii.
[2] Includes bentonite, diatomaceous shale, and fuller's earth.
[3] Includes iron ore, pyrite cinders and ore, and mill scale.
[4] Includes diatomite, fluorspar, pumicite, flue dust, pitch, red mud and rock, hydrated lime, tufa, cinders, calcium chloride, sludge, grinding aids, and air-entraining compounds.

FUEL AND POWER

Of the types of fuel consumed by the portland-cement industry, the quantity of coal used decreased slightly as compared to 1949, while all other types showed greater quantities consumed than in the preceding year. The amount of coal used declined fractionally while the percentage gains for the other fuel types were: Fuel oil, 15 percent; natural gas, 15 percent; byproduct gas, 6 percent.

The number of plants using electric energy, the kilowatt-hours generated and purchased, and the average electric energy used per barrel of cement are shown in table 16. The ratio between the amount of electricity generated and the quantity purchased remained about the same in 1950 as in 1949.

TABLE 14.—Finished portland cement produced and fuel consumed by the portland-cement industry in the United States,[1] 1949–50, by processes

Process	Finished cement produced			Fuel consumed [2]		
	Plants	Barrels of 376 pounds	Percent of total	Coal (short tons)	Oil (barrels of 42 gallons)	Natural gas (M cubic feet)
1949						
Wet	88	116, 522, 681	55. 6	3, 830, 313	3, 203, 950	61, 783, 635
Dry	62	93, 204, 736	44. 4	4, 157, 247	1, 382, 648	[3] 22, 905, 649
Total	150	209, 727, 417	100. 0	[4] 7, 987, 560	4, 586, 598	[3] 84, 689, 284
1950						
Wet	89	127, 315, 811	56. 3	3, 735, 896	4, 074, 038	67, 384, 771
Dry	61	98, 710, 038	43. 7	4, 207, 267	1, 187, 190	[3] 29, 779, 788
Total	150	226, 025, 849	100. 0	[5] 7, 943, 163	5, 261, 228	[3] 97, 164, 559

[1] Includes Puerto Rico. There was no production in Hawaii.
[2] Figures compiled from monthly estimates of producers.
[3] Includes byproduct gas: 1949—168,088 M cubic feet; 1950—178,236 M cubic feet.
[4] Comprises 22,019 tons of anthracite and 7,965,541 tons of bituminous coal.
[5] Comprises 22,034 tons of anthracite and 7,921,129 tons of bituminous coal.

TABLE 15.—Portland cement produced in the United States,[1] 1949–50, by kind of fuel

Fuel	Finished cement produced			Fuel consumed [2]		
	Number of plants	Barrels of 376 pounds	Percent of total	Coal (short tons)	Oil (barrels of 42 gallons)	Natural gas (M cubic feet)
1949						
Coal	79	[3] 108, 639, 061	51. 8	6, 252, 160		
Oil	11	[3] 12, 317, 399	5. 9		2, 475, 865	
Natural gas	14	[3] 20, 215, 714	9. 6			30, 698, 450
Coal and oil	13	19, 920, 475	9. 5	1, 093, 047	888, 571	
Coal and natural gas	16	19, 192, 617	9. 2	497, 829		[4] 19, 667, 208
Oil and natural gas	8	18, 081, 667	8. 6		1, 133, 474	18, 746, 653
Coal, oil, and natural gas	9	11, 360, 484	5. 4	144, 524	88, 688	15, 576, 973
Total	150	209, 727, 417	100. 0	[5] 7, 987, 560	4, 586, 598	84, 689, 284
1950						
Coal	74	[3] 110, 150, 316	48. 7	6, 376, 924		
Oil	12	[3] 17, 167, 298	7. 6		3, 493, 368	
Natural gas	12	[3] 19, 675, 354	8. 7			28, 477, 976
Coal and oil	13	16, 596, 069	7. 3	774, 820	965, 778	
Coal and natural gas	19	26, 361, 132	11. 7	683, 407		[6] 23, 921, 835
Oil and natural gas	11	23, 919, 066	10. 6		712, 493	27, 430, 007
Coal, oil, and natural gas	9	12, 156, 614	5. 4	108, 012	89, 589	17, 334, 741
Total	150	226, 025, 849	100. 0	[7] 7, 943, 163	5, 261, 228	97, 164, 559

[1] Including Puerto Rico. There was no production in Hawaii.
[2] Figures compiled from monthly estimates of producers.
[3] Average consumption of fuel per barrel of cement produced was as follows: 1949—Coal, 115.1 pounds; oil, 0.2010 barrel; natural gas, 1,519 cubic feet. 1950—Coal, 115.8 pounds; oil, 0.2035 barrel; natural gas, 1,447 cubic feet.
[4] Includes 168,088 M cubic feet of byproduct gas.
[5] Comprises 22,019 tons of anthracite and 7,965,541 tons of bituminous coal
[6] Includes 178,236 M cubic feet of byproduct gas.
[7] Comprises 22,034 tons of anthracite and 7,921,129 tons of bituminous coal.

TABLE 16.—Electric energy used at portland-cement-producing plants in the United States,[1] 1949–50, by processes, in kilowatt-hours

Process	Electric energy used						Finished cement produced (barrels)	Average electric energy used per barrel of cement produced (kilowatt-hours)
	Generated at portland-cement plants		Purchased		Total			
	Active plants	Kilowatt-hours	Active plants	Kilowatt-hours	Kilowatt-hours	Percent		
1949								
Wet	32	792,393,327	79	1,755,800,663	2,548,193,990	54.5	116,522,681	21.9
Dry	33	1,194,368,472	51	932,661,738	2,127,030,210	45.5	93,204,736	22.8
Total	65	1,986,761,799	130	2,688,462,401	4,675,224,200	100.0	209,727,417	22.3
Percent of total electric energy used		42.5		57.5	100.0			
1950								
Wet	32	838,489,412	77	1,901,290,175	2,739,779,587	54.9	127,515,811	21.5
Dry	33	1,276,603,619	52	976,005,492	2,252,609,111	45.1	98,510,038	22.9
Total	65	2,115,093,031	129	2,877,295,667	4,992,388,698	100.0	226,025,849	22.1
Percent of total electric energy used		42.4		57.6	100.0			

[1] Including Puerto Rico. There was no production in Hawaii.

EMPLOYMENT AND PRODUCTIVITY

Trends in employment and output per man in the cement industry over the period 1943–47 are shown in tables 17 through 23.

TABLE 17.—Employment in the portland-cement industry, finished cement produced, and average output per man in the United States,[1] 1943–47

Year	Employment					Production			Percent of industry represented[2]
	Average number of men	Time employed				Finished portland cement (barrels)	Average per man (barrels)		
		Average number of days	Total man-shifts	Man-hours					
				Average per man per day	Total		Per shift	Per hour	
1943	25,453	300	7,626,376	7.7	58,737,442	132,445,838	17.37	2.25	99.3
1944	20,376	278	5,670,147	8.0	45,236,906	89,883,262	15.85	1.99	98.9
1945	20,695	287	5,937,680	8.0	47,612,919	101,340,500	17.07	2.13	98.6
1946	25,044	313	7,836,818	8.0	62,384,279	162,296,274	20.71	2.60	98.9
1947	26,962	318	8,569,626	7.9	67,836,375	184,644,179	21.55	2.72	99.0

[1] Exclusive of Puerto Rico and Hawaii.
[2] Calculated for each year by dividing quantity of finished cement produced at mills included in the employment survey by total production as determined by the production survey.

TABLE 18.—Mill employees in the portland-cement industry, finished cement produced, and average output per man in the United States,[1] 1943–47

Year	Employment—cement mills only					Production			Percent of industry represented[2]
	Average number of men	Time employed				Finished portland cement (barrels)	Average per man (barrels)		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average per man per day	Total				
1943	19,958	308	6,156,775	7.6	47,004,631	132,445,838	21.51	2.82	99.3
1944	15,566	289	4,501,364	8.0	35,826,375	89,883,262	19.97	2.51	98.9
1945	16,142	299	4,820,735	8.0	38,551,413	101,340,500	21.02	2.63	98.6
1946	18,101	325	5,874,801	7.9	46,610,834	162,296,274	27.63	3.48	98.9
1947	18,327	330	6,056,358	7.9	47,716,276	184,644,179	30.49	3.87	99.0

[1] Exclusive of Puerto Rico and Hawaii.
[2] *See* footnote 2, table 17.

TABLE 19.—Quarry and crusher employees in the portland-cement industry, material handled, and average output of material per man in the United States,[1] 1943–47

Year	Employment—quarries and crushers only					Material handled—quarry rock			Percent of industry represented[2]
	Average number of men	Time employed				Short tons	Average per man (short tons)		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average per man per day	Total				
1943	4,403	262	1,152,041	8.0	9,231,784	39,191,018	34.02	4.25	92.1
1944	3,489	245	855,934	8.2	7,001,742	28,307,328	33.07	4.04	91.6
1945	3,500	245	857,117	8.1	6,954,881	29,122,715	33.98	4.19	90.8
1946	4,307	271	1,166,537	8.0	9,370,921	45,065,371	38.63	4.81	90.9
1947	4,704	282	1,328,625	8.0	10,638,458	51,493,686	38.76	4.84	90.0

[1] Exclusive of Puerto Rico and Hawaii.
[2] Calculated for each year by dividing quantity of finished cement produced at mills, for which quarry employment reported, by total production as determined by production survey.

TABLE 20.—Number of men employed in the portland-cement industry in the United States,[1] and output per man-hour, 1945–47, classified according to hours of labor per day

Hours per day	1945			1946			1947		
	Men employed		Production per man-hour (barrels)	Men employed		Production per man-hour (barrels)	Men employed		Production per man-hour (barrels)
	Number	Percent of total		Number	Percent of total		Number	Percent of total	
Less than 6	--------	--------	--------	--------	--------	--------	403	1.5	2.82
6 and less than 7	402	1.9	1.60	772	3.1	2.51	1,129	4.2	2.93
7 and less than 8	944	4.6	2.50	1,339	5.3	2.83	877	3.2	3.36
8 and less than 9	18,731	90.5	2.12	22,783	91.0	2.57	24,388	90.5	2.64
9 and less than 10	618	3.0	2.04	150	.6	3.73	165	.6	3.60
10 and less than 11	--------	--------	--------					--------	--------
11 and less than 12	--------	--------	--------	--------	--------	--------	--------	--------	--------
Total	20,695	100.0	2.13	25,044	100.0	2.60	26,962	100.0	2.72

[1] Exclusive of Puerto Rico and Hawaii.

TABLE 21.—Employment in the portland-cement industry, finished cement produced, and average output per man in the United States,[1] 1946–47, by districts

District	Employment					Production			Percent of industry represented[2]
	Average number of men	Time employed				Finished portland cement (barrels)	Average per man (barrels)		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average per man per day	Total				
1946									
Eastern Pennsylvania and Maryland	4, 318	304	1, 313, 830	8. 0	10, 532, 303	26, 489, 149	20. 16	2. 52	100. 0
New York and Maine	1, 944	293	568, 795	7. 8	4, 430, 762	11, 411, 868	20. 06	2. 58	100. 0
Ohio	1, 295	321	415, 835	8. 0	3, 327, 875	8, 034, 762	19. 32	2. 41	100. 0
Western Pennsylvania and West Virginia	1, 390	292	406, 546	8. 0	3, 241, 619	6, 741, 134	16. 58	2. 08	100. 0
Michigan	1, 366	319	435, 431	8. 0	3, 487, 947	9, 693, 767	22. 26	2. 78	100. 0
Illinois	1, 024	324	331, 595	8. 0	2, 653, 424	6, 270, 252	18. 91	2. 36	100. 0
Indiana, Kentucky, and Wisconsin	1, 824	342	623, 780	8. 0	4, 995, 854	10, 571, 385	16. 95	2. 12	100. 0
Alabama	1, 006	299	300, 596	8. 0	2, 416, 172	7, 897, 157	26. 27	3. 27	100. 0
Tennessee	855	289	247, 455	7. 9	1, 963, 356	5, 218, 370	21. 09	2. 66	100. 0
Virginia, Georgia, Florida, and Louisiana	1, 112	327	363, 277	7. 5	2, 714, 582	5, 656, 967	15. 57	2. 08	100. 0
Iowa	1, 014	318	322, 546	8. 0	2, 572, 493	5, 513, 070	17. 09	2. 14	100. 0
Eastern Missouri, Minnesota, and South Dakota	1, 378	302	415, 950	8. 0	3, 329, 155	7, 641, 752	18. 37	2. 30	100. 0
Kansas	956	300	287, 197	7. 9	2, 265, 545	6, 404, 648	22. 30	2. 83	100. 0
Western Missouri, Nebraska, Oklahoma, and Arkansas	808	345	278, 928	7. 8	2, 164, 845	5, 703, 483	20. 45	2. 63	100. 0
Texas	1, 319	326	430, 158	8. 2	3, 520, 052	10, 712, 538	24. 90	3. 04	100. 0
Colorado, Wyoming, Montana, Utah, and Idaho	601	334	200, 993	7. 9	1, 596, 538	4, 088, 203	20. 34	2. 56	100. 0
California	2, 029	330	669, 258	8. 0	5, 370, 974	19, 540, 790	29. 20	3. 64	100. 0
Oregon and Washington	805	279	224, 648	8. 0	1, 800, 783	4, 706, 979	20. 95	2. 61	100. 0
Total	25, 044	313	7, 836, 818	8. 0	62, 384, 279	162, 296, 274	20. 71	2. 60	98. 9
1947									
Eastern Pennsylvania and Maryland	4, 342	305	1, 323, 643	8. 0	10, 621, 839	29, 602, 680	22. 36	2. 79	100. 0
New York and Maine	2, 147	294	631, 940	7. 5	4, 735, 609	12, 132, 952	19. 20	2. 56	100. 0
Ohio	1, 326	337	447, 002	8. 0	3, 595, 454	9, 382, 564	20. 99	2. 61	100. 0
Western Pennsylvania and West Virginia	1, 622	331	536, 736	8. 0	4, 294, 325	8, 168, 412	15. 22	1. 90	100. 0
Michigan	1, 249	332	414, 571	8. 0	3, 329, 432	10, 211, 809	24. 63	3. 07	100. 0
Illinois	1, 069	325	346, 914	8. 0	2, 776, 012	7, 227, 748	20. 83	2. 60	100. 0
Indiana, Kentucky, and Wisconsin	2, 075	328	680, 576	8. 0	5, 456, 150	11, 636, 308	17. 10	2. 13	100. 0
Alabama	1, 058	313	331, 484	8. 1	2, 668, 665	9, 514, 190	28. 70	3. 57	100. 0
Tennessee	760	312	236, 860	8. 0	1, 896, 156	5, 900, 618	24. 91	3. 11	100. 0
Virginia, Georgia, Florida, and Louisiana	1, 231	290	357, 033	7. 7	2, 741, 531	6, 118, 256	17. 14	2. 23	100. 0
Iowa	1, 133	311	352, 745	7. 8	2, 763, 191	6, 335, 666	17. 96	2. 29	100. 0
Eastern Missouri, Minnesota, and South Dakota	1, 385	324	448, 511	8. 0	3, 595, 695	9, 134, 368	20. 37	2. 54	100. 0
Kansas	1, 153	299	345, 006	7. 7	2, 661, 099	7, 131, 802	20. 67	2. 68	100. 0
Western Missouri, Nebraska, Oklahoma, and Arkansas	929	338	313, 937	8. 0	2, 509, 445	6, 392, 194	20. 36	2. 55	100. 0
Texas	1, 548	334	516, 330	7. 9	4, 069, 819	12, 462, 925	24. 14	3. 06	100. 0
Colorado, Wyoming, Montana, Utah, and Idaho	586	345	202, 263	8. 0	1, 617, 988	4, 586, 069	22. 67	2. 83	100. 0
California	2, 381	329	782, 713	8. 0	6, 281, 952	22, 788, 173	29. 11	3. 63	100. 0
Oregon and Washington	968	311	301, 362	7. 4	2, 222, 013	5, 917, 445	19. 64	2. 66	100. 0
Total	26, 962	318	8, 569, 626	7. 9	67, 836, 375	184, 644, 179	21. 55	2. 72	99. 0

[1] Exclusive of Puerto Rico and Hawaii.
[2] *See* footnote 2, table 17.

TABLE 22.—Mill employees in the portland-cement industry, finished cement produced, and average output per man in the United States,[1] 1946–47, by districts

District	Employment—cement mills only					Production			Percent of industry represented[2]
	Average number of men	Time employed				Finished portland cement (barrels)	Average per man (barrels)		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average per man per day	Total				
1946									
Eastern Pennsylvania and Maryland	2, 874	317	910, 500	8. 0	7, 294, 081	26, 489, 149	29. 09	3. 63	100. 0
New York and Maine	1, 313	304	399, 686	7. 7	3, 079, 076	11, 411, 868	28. 55	3. 71	100. 0
Ohio	926	330	305, 421	8. 0	2, 443, 439	8, 034, 762	26. 31	3. 29	100. 0
Western Pennsylvania and West Virginia	869	302	262, 822	7. 9	2, 088, 912	6, 741, 134	25. 65	3. 23	100. 0
Michigan	1, 256	322	404, 394	8. 0	3, 235, 484	9, 693, 767	23. 97	3. 00	100. 0
Illinois	757	333	251, 989	8. 0	2, 016, 436	6, 270, 252	24. 88	3. 11	100. 0
Indiana, Kentucky, and Wisconsin	1, 581	350	552, 652	8. 0	4, 421, 316	10, 571, 385	19. 13	2. 39	100. 0
Alabama	665	314	208, 894	8. 0	1, 676, 755	7, 897, 157	37. 80	4. 71	100. 0
Tennessee	534	295	157, 538	7. 9	1, 240, 889	5, 218, 370	33. 12	4. 21	100. 0
Virginia, Georgia, Florida, and Louisiana	832	336	279, 549	7. 4	2, 057, 179	5, 656, 967	20. 24	2. 75	100. 0
Iowa	791	333	263, 232	8. 0	2, 096, 074	5, 513, 070	20. 94	2. 63	100. 0
Eastern Missouri, Minnesota, and South Dakota	867	319	276, 831	8. 0	2, 214, 583	7, 641, 752	27. 60	3. 45	100. 0
Kansas	709	310	219, 998	7. 8	1, 709, 223	6, 404, 648	29. 11	3. 75	100. 0
Western Missouri, Nebraska, Oklahoma and Arkansas	658	355	233, 890	7. 7	1, 794, 728	5, 703, 483	24. 39	3. 18	100. 0
Texas	1, 009	334	337, 116	8. 2	2, 766, 076	10, 712, 538	31. 78	3. 87	100. 0
Colorado, Wyoming, Montana, Utah, and Idaho	446	342	152, 407	7. 9	1, 204, 728	4, 088, 203	26. 82	3. 39	100. 0
California	1, 469	341	500, 444	8. 0	4, 011, 548	19, 540, 790	39. 05	4. 87	100. 0
Oregon and Washington	545	289	157, 438	8. 0	1. 260,307	4, 706, 979	29. 90	3. 73	100. 0
Total	18, 101	325	5, 874, 801	7. 9	46, 610, 834	162, 296, 274	27. 63	3. 48	98. 9
1947									
Eastern Pennsylvania and Maryland	2, 911	313	910, 813	8. 0	7, 292, 416	29, 602, 680	32. 50	4. 06	100. 0
New York and Maine	1, 397	305	425, 831	7. 3	3, 117, 922	12, 132, 952	28. 49	3. 89	100. 0
Ohio	955	353	336, 669	8. 0	2, 694, 974	9, 382, 564	27. 87	3. 48	100. 0
Western Pennsylvania and West Virginia	975	348	338, 876	8. 0	2, 711, 166	8, 168, 412	24. 10	3. 01	100. 0
Michigan	873	353	308, 180	8. 0	2, 478, 302	10, 211, 809	33. 14	4. 12	100. 0
Illinois	762	342	260, 843	8. 0	2, 086, 696	7, 227, 748	27. 71	3. 46	100. 0
Indiana, Kentucky, and Wisconsin	1, 618	337	544, 458	8. 0	4, 355, 652	11, 636, 308	21. 37	2. 67	100. 0
Alabama	714	323	230, 966	8. 1	1, 859, 770	9, 514, 190	41. 19	5. 12	100. 0
Tennessee	517	307	158, 479	8. 0	1, 267, 818	5, 900, 618	37. 23	4. 65	100. 0
Virginia, Georgia, Florida, and Louisiana	883	287	253, 509	7. 6	1, 925, 043	6, 118, 256	24. 13	3. 18	100. 0
Iowa	874	327	285, 562	7. 8	2, 225, 734	6, 335, 666	22. 19	2. 85	100. 0
Eastern Missouri, Minnesota, and South Dakota	862	359	309, 091	8. 0	2, 473, 115	9, 134, 368	29. 55	3. 69	100. 0
Kansas	740	304	224, 802	7. 6	1, 707, 093	7, 131, 802	31. 72	4. 18	100. 0
Western Missouri, Nebraska, Oklahoma, and Arkansas	610	359	219, 237	8. 0	1, 761, 890	6, 392, 194	29. 16	3. 63	100. 0
Texas	1, 114	352	392, 313	7. 8	3, 078, 686	12, 462, 925	31. 77	4. 05	100. 0
Colorado, Wyoming, Montana, Utah, and Idaho	387	353	136, 498	8. 0	1, 091, 974	4, 586, 069	33. 60	4. 20	100. 0
California	1, 547	339	524, 044	8. 0	4, 189, 395	22, 788, 173	43. 49	5. 44	100. 0
Oregon and Washington	588	334	196, 187	7. 1	1, 398, 630	5, 917, 445	30. 16	4. 23	100. 0
Total	18, 327	330	6, 056, 358	7. 9	47, 716, 276	184, 644, 179	30. 49	3. 87	99. 0

[1] Exclusive of Puerto Rico and Hawaii.
[2] See footnote 2, table 17.

TABLE 23.—Quarry and crusher employees in the portland-cement industry, material (quarry rock) handled, and average output of material per man in the United States,[1] 1946–47, by districts

District	Employment—quarry and crusher only					Material handled—quarry rock			Percent of industry represented[2]
	Average number of men	Time employed				Short tons	Average per man (short tons)		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average per man per day	Total				
1946									
Eastern Pennsylvania and Maryland	744	258	191,784	8.0	1,542,354	8,122,189	42.35	5.27	94.9
New York and Maine	308	242	74,687	8.1	603,077	2,822,636	37.79	4.68	100.0
Ohio	266	284	75,612	8.0	605,726	2,232,602	29.53	3.69	100.0
Western Pennsylvania and West Virginia	346	270	93,454	8.0	748,122	3,058,103	32.72	4.09	68.5
Michigan	75	262	19,665	8.2	161,491	1,155,535	58.76	7.16	63.4
Illinois	131	291	38,105	8.0	304,871	1,798,314	47.19	5.90	100.0
Indiana, Kentucky, and Wisconsin	226	286	64,591	8.1	522,244	1,344,155	20.81	2.57	59.0
Alabama	219	265	58,052	7.9	461,381	2,461,262	42.40	5.33	97.9
Tennessee	212	254	53,908	8.1	435,338	1,544,069	28.64	3.55	100.0
Virginia, Georgia, Florida, and Louisiana	231	290	67,041	7.7	516,776	1,878,448	28.02	3.63	100.0
Iowa	169	244	41,235	8.0	331,790	1,684,233	40.84	5.08	100.0
Eastern Missouri, Minnesota, and South Dakota	210	280	58,742	8.0	470,971	1,932,744	32.90	4.10	85.0
Kansas	192	265	50,818	8.0	406,532	1,896,022	37.31	4.66	100.0
Western Missouri, Nebraska, Oklahoma, and Arkansas	136	295	40,143	8.2	330,207	1,876,761	46.75	5.68	100.0
Texas	143	281	40,173	8.1	327,388	2,476,466	61.65	7.56	94.1
Colorado, Wyoming, Montana, Utah, and Idaho	93	308	28,598	8.1	231,526	1,320,220	46.16	5.70	99.7
California	415	295	122,533	8.1	989,175	6,225,678	50.81	6.29	95.8
Oregon and Washington	191	248	47,396	8.1	381,952	1,235,934	26.08	3.24	88.3
Total	4,307	271	1,166,537	8.0	9,370,921	45,065,371	38.63	4.81	90.9
1947									
Eastern Pennsylvania and Maryland	799	263	210,475	8.0	1,688,731	8,171,488	38.82	4.84	94.7
New York and Maine	307	255	78,195	7.9	615,834	2,911,060	37.23	4.73	100.0
Ohio	279	287	80,192	8.2	658,745	2,352,218	29.33	3.57	100.0
Western Pennsylvania and West Virginia	401	307	123,199	8.0	985,597	4,071,264	33.05	4.13	63.5
Michigan	67	288	19,308	8.0	154,465	744,236	38.55	4.82	54.0
Illinois	205	284	58,208	8.0	465,683	2,249,539	38.65	4.83	100.0
Indiana, Kentucky, and Wisconsin	199	280	55,691	8.2	457,082	2,047,128	36.76	4.48	59.8
Alabama	226	274	62,036	7.9	489,476	2,681,333	43.22	5.48	87.8
Tennessee	175	325	56,829	8.0	455,920	1,655,910	29.14	3.63	88.6
Virginia, Georgia, Florida, and Louisiana	268	284	76,147	7.9	600,231	2,140,863	28.11	3.57	100.0
Iowa	178	245	43,652	8.0	349,209	2,048,644	46.93	5.87	100.0
Eastern Missouri, Minnesota, and South Dakota	229	275	62,986	8.0	504,606	2,189,785	34.77	4.34	85.4
Kansas	184	269	49,464	8.1	401,306	2,134,796	43.16	5.32	100.0
Western Missouri, Nebraska, Oklahoma, and Arkansas	174	295	51,299	7.8	400,352	2,061,540	40.19	5.15	100.0
Texas	145	315	45,660	8.0	365,709	2,802,877	61.39	7.66	94.3
Colorado, Wyoming, Montana, Utah, and Idaho	91	333	30,282	8.0	242,148	1,463,052	48.31	6.04	100.0
California	525	297	155,723	8.0	1,248,231	7,867,396	50.52	6.30	97.3
Oregon and Washington	252	275	69,279	8.0	555,133	1,900,557	27.43	3.42	100.0
Total	4,704	282	1,328,625	8.0	10,638,458	51,493,686	38.76	4.84	90.0

[1] Exclusive of Puerto Rico and Hawaii.
[2] *See* footnote 2, table 17.

TRANSPORTATION

The quantity and proportion of cement shipped by each of the major methods of transportation for 1948–50 are listed in table 20. The percentage shipped in bulk increased 5 percent from 1949 to 1950 to 55 percent of the total output; this was the first time that bulk shipments have represented over half of the domestic production. A 3-percent increase in truck shipments was noted, while rail bulk shipments declined a like amount and boat shipments remained virtually the same.

TABLE 24.—Shipments of portland cement from mills in the United States,[1] 1948–50, in bulk and in containers, by types of carriers

[Barrels of 376 pounds]

Type of carrier	In bulk		In containers				Total shipments	
			Bags		Other containers[2] (barrels)	Total (barrels)		
	Barrels	Percent	Paper (barrels)	Cloth (barrels)			Barrels	Percent
1948								
Truck	[3] 18,526,570	21.7	16,242,337	1,329,250		17,571,587	34,538,532	16.9
Railroad	65,210,300	76.6	82,889,312	16,513,115	15,850	99,418,277	166,188,202	81.3
Boat	1,440,323	1.7	2,103,000	34,605		2,137,605	3,577,928	1.8
Total	85,177,193	100.0	101,234,649	17,876,970	15,850	119,127,469	204,304,662	100.0
Percent of total	41.7		49.5	8.8	(4)	58.3	100.0	
1949								
Truck	[3] 24,347,015	23.9	16,035,282	1,445,980		17,481,262	42,476,387	20.6
Railroad	75,382,590	74.0	72,671,678	13,042,686	9,335	85,723,699	160,463,954	77.9
Boat	2,171,648	2.1	941,863	32,123	125	974,111	3,139,984	1.5
Total	101,901,253	100.0	89,648,823	14,520,789	9,460	104,179,072	206,080,325	100.0
Percent of total	49.5		43.5	7.0	(4)	50.5	100.0	
1950								
Truck	[3] 32,813,799	26.4	21,554,555	357,547		21,912,102	54,725,901	24.0
Railroad	89,209,877	71.6	77,911,406	2,979,928	11,318	80,902,652	170,112,529	74.7
Boat	2,495,582	2.0	400,752	21,418	454	422,624	2,918,206	1.3
Total	124,519,258	100.0	99,866,713	3,358,893	11,772	103,237,378	227,756,636	100.0
Percent of total	54.7		43.8	1.5	(4)	45.3	100.0	

[1] Includes Puerto Rico.
[2] Includes steel drums and iron and wood barrels.
[3] Includes cement used at mills by producers as follows—1948: 645,420 barrels; 1949: 643,174 barrels; 1950: 929,451 barrels.
[4] Less than 0.05 percent.

CONSUMPTION

Table 25 shows that the indicated consumption of portland cement in 1950 increased in 39 States and the District of Columbia. As compared to 1949, percentage increases ranged up to 80 percent for Montana, with New Mexico, South Carolina, Nevada, and Missouri showing substantial gains. West Virginia snowed the largest percentage decline with shipments off 32 percent. California, Texas, New York, Pennsylvania, Illinois, Ohio, and Michigan, in that order, were the largest consumers of cement in 1950. These 7 States accounted for 45 percent of the total consumption, while the 12 noncement-producing States, including the District of Columbia, accounted for 12 percent of the total consumption.

TABLE 25.—Destination of shipments of finished portland cement from mills in the United States, 1948–50, by States

Destination	1948 (barrels)	1949 (barrels)	1950 Barrels	1950 Change from 1949, percent
Continental United States:				
Alabama	3,178,143	2,910,444	3,395,505	+16.7
Arizona	1,766,820	1,262,378	1,572,137	+24.5
Arkansas	1,729,254	2,058,505	2,406,455	+16.9
California	20,567,994	19,943,561	23,508,046	+17.9
Colorado	1,972,316	2,041,456	2,432,616	+19.2
Connecticut [1]	2,364,453	2,381,551	2,629,280	+10.4
Delaware [1]	502,794	746,858	806,434	+8.0
District of Columbia [1]	1,191,379	1,345,897	1,484,834	+10.3
Florida	4,493,013	4,487,460	4,998,502	+11.4
Georgia	3,100,808	2,848,784	3,313,750	+16.3
Idaho	870,172	1,041,074	1,004,858	−3.5
Illinois	10,580,915	11,385,563	11,557,409	+1.5
Indiana	5,596,464	5,578,176	5,611,993	+.6
Iowa	4,272,285	4,844,659	4,828,232	−.3
Kansas	4,213,812	4,137,843	4,793,853	+15.9
Kentucky	2,780,706	2,402,306	2,559,713	+6.6
Louisiana	3,820,931	3,986,777	4,551,836	+14.2
Maine	843,560	638,383	549,577	−13.9
Maryland	3,470,828	3,498,499	4,406,182	+25.9
Massachusetts [1]	3,328,225	3,542,911	4,161,610	+17.5
Michigan	8,942,493	9,291,483	9,645,331	+3.8
Minnesota	4,195,552	4,441,401	4,896,145	+10.2
Mississippi [1]	1,746,788	1,787,000	1,676,409	−6.2
Missouri	5,299,347	4,541,405	5,852,265	+28.9
Montana	674,642	782,781	1,405,328	+79.5
Nebraska	2,094,185	2,537,791	2,538,361	----------
Nevada [1]	262,543	249,342	325,997	+30.7
New Hampshire [1]	505,735	542,685	520,977	−4.0
New Jersey [1]	6,103,555	6,109,668	7,239,023	+18.5
New Mexico [1]	1,204,872	1,291,189	2,101,080	+62.7
New York	14,272,508	16,353,001	15,537,337	−5.0
North Carolina [1]	3,434,257	3,048,417	3,699,380	+21.4
North Dakota [1]	901,701	725,855	928,766	+28.0
Ohio	10,249,103	10,057,975	10,307,833	+2.5
Oklahoma	3,830,317	3,884,555	4,425,102	+13.9
Oregon	2,159,785	2,559,215	2,603,223	+1.7
Pennsylvania	12,480,244	12,738,153	15,093,106	+18.5
Rhode Island [1]	739,570	728,803	845,092	+16.0
South Carolina	1,429,335	1,488,318	2,069,957	+39.1
South Dakota	1,050,780	1,093,465	1,354,744	+23.9
Tennessee	4,081,837	4,139,920	4,565,588	+10.3
Texas	12,893,560	13,183,797	16,671,621	+26.5
Utah	1,039,132	1,155,920	1,279,828	+10.7
Vermont [1]	458,626	445,759	317,345	−28.8
Virginia	3,550,455	3,832,190	4,068,441	+6.2
Washington	4,096,601	4,031,244	4,210,197	+4.4
West Virginia	2,155,276	2,803,256	1,898,334	−32.3
Wisconsin	5,060,929	4,540,926	5,274,002	+16.1
Wyoming	599,926	779,372	649,695	−16.6
Unspecified	35,141	52	35,049	(2)
Total continental United States	196,193,667	200,248,023	222,608,378	+11.2
Outside continental United States [3]	8,110,995	5,832,302	5,148,258	−11.7
Total shipped from cement plants	204,304,662	206,080,325	227,756,636	+10.5

[1] Non-cement-producing State.
[2] Over 500 percent.
[3] Direct shipments by producers to foreign countries and to noncontiguous Territories (Alaska, Hawaii, Puerto Rico, etc.), including distribution from Puerto Rican mills.

TABLE 26.—Destination of shipments of finished portland cement from mills in the United States in 1950, by months, in barrels

Destination	January	February	March	April	May	June	July	August	September	October	November	December
Alabama	218, 666	226, 996	250, 856	263, 157	294, 201	305, 340	289. 998	323. 756	324, 415	352, 177	310, 083	235, 720
Arizona	103, 443	125, 404	144, 366	132, 198	135, 298	137. 374	109, 554	129, 381	128. 879	121, 583	147, 795	162, 678
Arkansas	111, 459	132, 449	193, 699	205, 636	188, 793	244, 702	257. 947	257, 990	222, 601	224. 978	231, 046	116, 969
California	1, 271, 482	1, 474, 739	2, 090, 350	1, 930, 131	2, 125, 362	2, 296, 756	2, 074, 403	2, 309, 435	2, 097, 549	2, 206, 791	1, 866. 667	1, 786, 373
Colorado	81, 517	126, 025	183, 722	224, 802	198, 269	234, 278	249, 193	276. 443	257. 536	238, 010	215. 558	146, 716
Connecticut	99, 246	59, 000	120. 673	220, 129	279, 327	306, 092	325, 384	271, 939	255, 103	282. 104	273, 826	136, 508
Delaware	54, 700	42, 012	83, 019	92, 175	79, 249	103, 524	69, 066	69, 702	53. 678	67, 533	69. 535	31, 421
District of Columbia	115, 249	94, 943	125, 576	155, 571	134, 013	146, 665	128, 797	130, 654	114. 813	118, 556	137. 061	73, 694
Florida	440, 774	420, 422	497, 008	471, 453	512, 152	486, 047	425, 028	367, 882	300, 006	313, 613	341. 645	437, 106
Georgia	221. 000	225, 020	263, 230	299, 927	303, 706	296, 903	275, 501	320. 016	297. 674	309. 561	275, 177	225, 151
Idaho	12, 889	33, 980	74, 695	91, 722	111, 294	110, 410	104, 326	112, 675	106, 431	98, 067	82, 983	64, 821
Illinois	271, 122	311, 626	546, 632	812, 956	1, 269, 479	1, 279, 827	1, 370, 088	1, 544. 821	1, 361, 780	1, 436, 231	1, 023. 883	353. 507
Indiana	157, 065	179, 848	292, 022	409, 011	599, 633	626, 173	663. 036	700, 825	607, 721	670, 948	507. 703	174. 379
Iowa	54, 476	63, 646	187, 864	376. 787	561, 144	641, 876	582, 634	684, 103	561, 206	644, 767	331, 714	79, 802
Kansas	117, 521	196, 611	341, 253	518, 187	558, 199	460, 119	396, 638	427, 105	556, 109	555, 531	465, 548	256, 841
Kentucky	72, 462	93, 374	169, 708	219, 205	277, 041	290, 830	282, 712	315, 832	262, 959	281, 578	225, 491	70, 889
Louisiana	278, 375	282, 015	345, 951	345, 948	404, 385	399, 154	390, 977	427, 273	417, 603	448, 325	429, 470	391, 395
Maine	10, 379	6, 642	12, 956	36, 993	72, 863	91, 612	52, 676	60, 830	62, 919	60, 743	56, 303	24. 477
Maryland	241, 069	158, 544	241, 333	403, 070	386, 113	504, 248	449, 591	455, 692	413. 239	397, 118	449, 180	223, 737
Massachusetts	183, 299	133, 453	224, 552	355, 496	458, 996	452, 218	430, 005	436, 830	398, 348	503, 341	427. 236	241. 888
Michigan	264, 112	246, 137	340, 762	568, 140	1, 143, 938	1, 285, 920	1, 145, 080	1, 252, 712	1, 075, 951	1, 168, 703	804, 790	355, 013
Minnesota	65, 573	110, 557	190, 976	273, 337	523, 747	779, 891	649, 437	724, 624	572. 004	520, 577	350, 187	128, 903
Mississippi	87, 317	88, 875	106, 667	113, 895	128, 048	127, 318	167, 099	170, 705	177, 677	154, 671	168, 887	111, 551
Missouri	149, 708	226, 713	369, 572	455, 122	546, 617	618, 071	668, 923	732, 340	697, 478	709, 249	503, 088	260, 023
Montana	7, 701	19, 039	58, 500	90, 865	138, 174	162, 908	189, 728	202, 747	223, 309	203, 755	82, 311	26, 248
Nebraska	36, 056	52, 469	137, 419	238, 656	281, 232	349, 597	266, 107	321, 293	270, 883	294, 489	224, 276	65, 826
Nevada	15, 821	20, 662	26, 150	23, 123	32, 425	30, 036	30, 031	36, 210	33, 744	33, 057	26, 176	19, 883
New Hampshire	19, 508	14, 435	18, 919	43, 179	57, 535	57, 836	55, 875	57, 953	56, 651	59, 697	53, 944	27, 374
New Jersey	382, 970	233, 113	396, 035	615, 985	712, 890	738, 924	736, 365	724, 838	702, 428	815, 933	757, 998	420. 844
New Mexico	84, 591	105, 770	131, 618	135, 432	155, 123	140, 657	128. 012	137. 813	146, 766	159, 707	168, 636	138, 156
New York	703, 143	427, 617	827, 771	1, 424, 925	1, 804, 126	1, 923, 109	1, 479, 267	1, 818, 253	1, 647, 148	1, 795, 153	1, 459, 102	690, 068
North Carolina	217, 579	214, 982	217, 329	331, 814	393, 089	387, 612	285, 099	331, 304	312, 633	324, 385	366, 038	302, 195
North Dakota	3, 506	12, 653	50, 316	50, 086	84, 424	143, 239	145, 994	147, 316	115, 077	92, 476	54, 822	44, 263
Ohio	359, 875	324, 525	499, 368	738, 738	1, 155, 304	1, 284, 721	1, 214, 661	1, 135, 590	1, 057, 742	1, 342, 756	861, 252	335, 188
Oklahoma	185, 701	291, 844	422, 259	442, 833	412, 640	404, 785	326, 419	383, 223	361, 121	402, 820	438, 398	352, 903
Oregon	60, 991	74, 939	188, 523	194, 491	194, 356	241, 832	259, 698	298, 824	327, 408	291, 072	218, 363	252, 617
Pennsylvania	564, 525	437, 100	703, 359	1, 146, 149	1, 415, 317	1, 784, 987	1, 816, 032	1, 919, 532	1, 693, 400	1, 811, 953	1, 250, 861	530, 167
Rhode Island	31, 340	19, 803	40, 187	91, 123	95, 425	91, 241	90, 338	80, 358	75, 942	90, 609	89, 966	48, 420
South Carolina	153, 898	164, 370	185, 661	186, 696	183, 780	176, 244	161, 613	174, 242	152, 978	163, 299	179, 748	182, 982
South Dakota	18, 437	35, 779	54, 923	86, 426	130, 888	206, 776	196, 034	194, 913	174, 513	165, 473	65, 078	25, 484
Tennessee	203, 636	250, 176	345, 029	401, 800	461, 271	431, 798	407, 907	475, 179	474, 250	494, 170	371, 306	249, 101
Texas	1, 012, 295	1, 071, 656	1, 533, 437	1, 475, 155	1, 519, 048	1, 399, 551	1, 453, 244	1, 499, 937	1, 372, 577	1, 429, 433	1, 485, 399	1, 422, 371

TABLE 26.—**Destination of shipments of finished portland cement from mills in the United States in 1950, by months, in barrels**—Con.

Destination	January	February	March	April	May	June	July	August	September	October	November	December
Utah	19, 014	42, 020	92, 299	117, 972	119, 372	140, 403	129, 967	155, 088	139, 514	137, 452	105, 058	81, 502
Vermont	5, 604	3, 819	7, 068	21, 504	36, 504	45, 436	36, 572	39, 310	43, 292	46, 438	26, 021	7, 022
Virginia	236, 605	202, 392	282, 222	396, 710	419, 474	426, 362	339, 534	378, 138	317, 485	330, 832	430, 705	308, 624
Washington	25, 554	164, 518	307, 977	401, 695	493, 389	433, 301	462, 673	546, 358	497, 959	387, 124	301, 456	182, 110
West Virginia	104, 452	93, 532	125, 899	169, 780	191, 002	197, 791	173, 530	226, 477	183, 708	221, 396	160, 562	50, 778
Wisconsin	92, 362	124, 563	163, 508	255, 632	599, 210	813, 736	725, 557	721, 495	644, 039	597, 654	418, 318	124, 170
Wyoming	14, 624	23, 269	46, 941	65, 389	67, 560	81, 833	65, 201	79, 886	65, 435	63, 446	48, 150	28, 623
Unspecified	26, 699	7, 933	5, 828	16, 672	2, 649	5, 218	2, 163	41, 319	21, 844	11, 493	4, 001	2, 249
Continental United States	9, 269, 390	9, 492, 009	14, 265, 987	18, 137, 878	22, 448, 074	24, 325, 281	22, 735, 714	24, 631, 161	22, 435, 525	23, 650, 827	19, 342, 801	12, 008, 730
Outside continental United States [1]	362, 610	331, 991	403, 013	286, 122	385, 926	423, 719	431, 286	512, 839	474, 475	516, 173	448, 199	468, 270
Total	9, 632, 000	9, 824, 000	14, 669, 000	18, 424, 000	22, 834, 000	24, 749, 000	23, 167, 000	25, 144, 000	22, 910, 000	24, 167, 000	19, 791, 000	12, 477, 000

[1] Shipments by producers to foreign countries and to noncontiguous Territories of the United States (Alaska, Hawaii, Puerto Rico, etc.), including distribution from Puerto Rican mills.

LOCAL SUPPLY

The surplus or deficiency in the quantity of cement locally available is indicated in table 27. The comparison is based on shipments from mills and on consumption as shown by State receipts of mill shipments. The 1950 deficiencies occurred in one State and five districts.

The total surplus of producing States in 1950 was distributed as follows: 27,400,258 barrels to non-cement-producing States, Alaska, and Hawaii; 2,773,010 barrels to destinations outside continental United States (excluding local consumption of Puerto Rican production); and 35,049 barrels to unspecified destinations.

TABLE 27.—Estimated surplus or deficiency in local supply of portland cement in cement-producing States, 1949–50, in barrels

State or division	1949			1950		
	Shipments from mills	Estimated consumption	Surplus or deficiency	Shipments from mills	Estimated consumption	Surplus or deficiency
Alabama	9, 394, 348	2, 910, 444	+6, 483, 904	10, 574, 955	3, 395, 505	+7, 179, 450
California	23, 201, 982	19, 943, 561	+3, 258, 421	26, 685, 004	23, 508, 046	+3, 176, 958
Illinois	7, 976, 972	11, 385, 563	−3, 408, 591	7, 857, 969	11, 557, 409	−3, 699, 440
Iowa	6, 655, 208	4, 844, 659	+1, 810, 549	7, 231, 807	4, 828, 232	+2, 403, 575
Kansas	7, 640, 540	4, 137, 843	+3, 502, 697	8, 759, 103	4, 793, 853	+3, 965, 250
Michigan	12, 747, 791	9, 291, 483	+3, 456, 308	12, 854, 423	9, 645, 331	+3, 209, 092
Missouri	8, 518, 636	4, 541, 405	+3, 977, 231	9, 779, 657	5, 852, 265	+3, 927, 392
Ohio	10, 157, 001	10, 057, 975	+99, 026	10, 512, 004	10, 307, 833	+204, 171
Pennsylvania	36, 905, 254	12, 738, 153	+24, 167, 101	39, 450, 611	15, 093, 106	+24, 357, 505
Puerto Rico	2, 171, 486	1, 660, 362	+511, 124	3, 187, 451	1, 711, 217	+1, 476, 234
Tennessee	5, 992, 571	4, 139, 920	+1, 852, 651	6, 663, 427	4, 565, 588	+2, 097, 839
Texas	14, 741, 805	13, 183, 797	+1, 558, 008	17, 281, 521	16, 671, 621	+609, 900
Colorado, Arizona, Wyoming, Montana, Utah, and Idaho	6, 149, 542	7, 062, 981	−913, 439	7, 886, 861	8, 344, 462	−457, 601
Oregon and Washington	6, 314, 030	6, 590, 459	−276, 429	6, 950, 797	6, 813, 420	+137, 377
Georgia, Kentucky, Virginia, Florida, Louisiana, and South Carolina	9, 791, 088	19, 045, 835	−9, 254, 747	10, 732, 533	21, 562, 199	−10, 829, 666
Indiana, Wisconsin, Minnesota, Nebraska, Oklahoma, South Dakota, and Arkansas	19, 391, 926	24, 134, 819	−4, 742, 893	22, 041, 790	26, 506, 802	−4, 465, 012
Maryland and West Virginia	4, 592, 826	6, 301, 755	−1, 708, 929	4, 908, 034	6, 304, 516	−1, 396, 482
New York and Maine	13, 737, 319	16, 991, 384	−3, 254, 065	14, 398, 689	16, 086, 914	−1, 688, 225
Total	206, 080, 325	178, 962, 398	+27, 117, 927	227, 756, 636	197, 548, 319	+30, 208, 317

PRICES

The average net mill realization of all portland cement shipped from mills in 1950 advanced to $2.35 per barrel from $2.30 in 1949. The average net mill realization in each quarter of 1950 was: First, $2.33; second, $2.33; third, $2.34; and fourth, $2.43.

The composite wholesale price of portland cement, f. o. b. destination, according to the Bureau of Labor Statistics index (1926=100) was 136.6 in 1950, whereas in 1949 it was 133.8.

Average mill value per barrel, in bulk, of portland cement in the United States,[1] 1945–50

1945	$1. 63	1948	$2. 18
1946	1. 72	1949	2. 30
1947	1. 90	1950	2. 35

[1] Includes Puerto Rico and Hawaii. 1945–46 ;Puerto Rico only, 1947–50. There has been no production in Hawaii since 1946.

FOREIGN TRADE [3]

Imports.—Imports of hydraulic cement soared in 1950, when they amounted to 1,394,015 barrels compared with 109,821 barrels in 1949. For the most part, purchases were made from Germany and the United Kingdom (England). Imports of all hydraulic cement, except white, nonstaining, and other special cement, for 1948–50 are listed by country of origin in table 29. Imports of white, nonstaining cement in 1950 amounted to 4,856 barrels valued at $24,915.

TABLE 28.—Hydraulic cement imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Barrels	Value	Year	Barrels	Value
1945	323	$700	1948	282,752	$785,120
1946	3,734	15,531	1949	109,821	329,969
1947	4,606	28,668	1950	1,394,015	3,610,056

TABLE 29.—Roman, portland, and other hydraulic cement imported for consumption in the United States, 1948–50, by countries [1]

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Barrels	Value	Barrels	Value	Barrels	Value
Belgium-Luxembourg	104,937	$261,927	37,412	$90,767	38,286	$102,774
Bulgaria	17	56				
Canada	3,030	14,109	639	2,162	16,896	79,324
Colombia					42,510	146,439
Dominican Republic			1,516	7,260		
France					7	35
Germany			26,620	75,000	730,468	1,981,880
Japan					71,797	205,897
Mexico	149,990	397,705	16,017	40,722	77,118	153,717
Netherlands					6,250	12,564
Norway			11,750	32,853		
United Kingdom	24,655	110,605	15,832	81,063	405,772	902,306
Total	282,629	784,402	109,786	329,827	1,389,104	3,584,933

[1] Excludes "white, nonstaining, and other special cement."

Exports.—Cement exports in 1950 declined nearly 50 percent to 2,418,435 barrels valued at $7,274,564. As indicated in the table 30, shipments to North America and to South America represented 96 percent of the total. The largest purchasers were Venezuela, Canada, Cuba, and Mexico.

Shipments of hydraulic cement to noncontiguous Territories of the United States for 1948–50 are shown in table 32. Shipments to Guam and the Virgin Islands were higher than in 1949, while shipments to Puerto Rico and American Samoa decreased. No shipments to Wake Island were reported.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 30.—Hydraulic cement exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Barrels	Value	Percent of total shipments from mills
1946	5, 163, 362	$13, 484, 933	3. 0
1947	[1] 6, 771, 250	[1] 21, 826, 718	3. 6
1948	5, 922, 163	20, 917, 176	2. 9
1949	4, 561, 899	15, 960, 954	2. 2
1950	2, 418, 435	7, 274, 564	1. 0

[1] Exclusive of 198,723 barrels, valued at $839,916 exported under the Army Civilian Supply Program.

TABLE 31.—Hydraulic cement exported from the United States, 1948–50, by countries of destination

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Barrels	Value	Barrels	Value	Barrels	Value
North America:						
Bermuda	634	$2, 998	25	$110	----------	----------
Canada	907, 400	3, 416, 965	1, 505, 976	5, 080, 765	} 456, 418	} $1, 598, 622
Newfoundland-Labrador	1, 145	4, 107	1, 550	3, 900		
Central America:						
British Honduras	250	950	1, 050	4, 523	1, 180	5, 424
Canal Zone	108, 045	333, 431	36, 293	90, 500	132	881
Costa Rica	72, 599	235, 924	43, 187	155, 430	41, 457	142, 838
El Salvador	47, 441	169, 578	33, 594	136, 713	10, 260	48, 006
Guatemala	26, 224	93, 942	26, 656	100, 385	3, 814	25, 581
Honduras	62, 752	210, 099	80, 200	277, 092	40, 904	141, 971
Nicaragua	9, 452	40, 225	6, 167	24, 804	8, 947	35, 254
Panama	82, 379	299, 747	2, 059	13, 532	1, 885	8, 846
Mexico	158, 623	577, 995	126, 381	490, 670	141, 795	560, 791
West Indies:						
British:						
Bahamas	10, 085	40, 396	11, 365	47, 118	1, 741	7, 668
Barbados	108	324	----------	----------	----------	----------
Jamaica	3, 508	14, 180	495	1, 930	582	2, 245
Leeward and Windward Islands	4, 783	16, 481	485	1, 845	1, 158	3, 671
Trinidad and Tobago	20, 375	63, 510	1, 927	8, 253	1, 078	4, 644
Cuba	398, 529	1, 421, 288	296, 246	980, 613	394, 460	1, 115, 206
Dominican Republic	215, 462	752, 212	62, 963	247, 905	24, 722	92, 699
French West Indies	3, 232	10, 480	2, 963	10, 608	1, 375	5, 075
Haiti	15, 757	57, 193	27, 058	99, 909	42, 448	116, 683
Netherlands Antilles	137, 746	470, 736	78, 404	259, 116	72, 734	179, 311
Other North America	250	719	----------	----------	----------	----------
Total North America	2, 286, 779	8, 233, 480	2, 345, 044	8, 035, 721	1, 247, 090	4, 095, 416
South America:						
Argentina	4, 455	40, 141	953	1, 741	373	6, 370
Bolivia	1, 546	14, 393	90	694	628	5, 257
Brazil	493, 622	1, 890, 808	33, 021	187, 209	3, 892	16, 285
Chile	8, 910	59, 120	2, 591	21, 593	4, 340	27, 480
Colombia	113, 195	478, 302	54, 453	332, 329	26, 701	193, 526
Ecuador	9, 888	34, 730	61, 945	221, 563	8, 400	25, 786
Paraguay	332	2, 532	2, 488	13, 726	370	1, 032
Peru	21, 629	74, 924	3, 057	18, 450	1, 133	9, 982
Surinam	3, 328	10, 698	8, 525	27, 257	1, 172	3, 827
Uruguay	1, 327	9, 348	472	4, 044	22	625
Venezuela	2, 020, 617	6, 822, 478	1, 751, 951	6, 072, 034	1, 027, 011	2, 444, 041
Other South America	68	301	75	994	----------	----------
Total South America	2, 678, 917	9, 437, 775	1, 919, 621	6, 901, 614	1, 074, 042	2, 734, 211
Europe:						
Belgium-Luxembourg	386	4, 524	132	955	294	2, 096
France	465	5, 763	829	4, 264	7	106
Italy	----------	----------	----------	----------	1, 712	12, 172
United Kingdom	190	1, 476	----------	----------	9	120
Other Europe	867	8, 085	391	5, 403	520	4, 178
Total Europe	1, 908	19, 848	1, 352	10, 622	2, 542	18, 672

TABLE 31.—Hydraulic cement exported from the United States, 1948–50, by countries of destination—Continued

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Barrels	Value	Barrels	Value	Barrels	Value
Asia:						
Bahrein	1,900	$15,284	4,401	$26,903	3,154	$12,920
Ceylon	21,649	70,111	150	992		
French Indochina	689	15,848				
Hong Kong	1,750	5,198				
India			17	400	15	1,512
Indonesia	71,381	226,380	80,075	254,534	4,902	19,200
Israel			1,388	13,455	25,698	173,715
Japan			44,633	143,116	60	1,771
Korea	162,503	527,291	61,843	201,592		
Kuwait	36,895	134,577	9,320	42,655	3,500	14,600
Philippines	400,397	1,321,795	17,873	70,381	3,783	30,438
Saudi Arabia	117,417	454,729	47,682	153,131	8,503	27,363
Turkey			479	1,259	39,862	123,184
Other Asia	4,626	16,624	681	4,266	2,254	10,299
Total Asia	819,207	2,787,837	268,542	912,684	91,731	415,002
Africa:						
Angola	4,950	19,882				
French West Africa	1,678	5,318	6,731	21,584		
Liberia	4,231	14,694	1,250	4,344		
Madagascar	65,349	189,369				
Mozambique	12,238	43,446				
Nigeria	1,440	4,714	4,915	16,419		
Union of South Africa	19,600	71,762	2,005	9,065		
Other Africa	6,334	23,560	1,420	4,973	92	387
Total Africa	115,820	372,745	16,321	56,385	92	387
Oceania:						
French Pacific Islands	14,825	49,746	4,036	14,934	1,094	4,107
New Zealand	3,782	12,746	4,198	17,922	856	2,998
Other Oceania	925	2,999	2,785	11,072	988	3,771
Total Oceania	19,532	65,491	11,019	43,928	2,938	10,876
Grand total	5,922,163	20,917,176	4,561,899	15,960,954	2,418,435	7,274,564

TABLE 32.—Hydraulic cement shipped to noncontiguous Territories of the United States, 1948–50

[U. S. Department of Commerce]

Territory	1948		1949		1950	
	Barrels	Value	Barrels	Value	Barrels	Value
American Samoa	495	$1,621	436	$1,687	280	$1,151
Guam	4,467	18,330	2,189	10,510	3,750	22,794
Puerto Rico	14,964	91,313	94,955	315,311	14,939	91,125
Virgin Islands	28,071	103,647	31,074	123,471	36,043	123,340
Wake Island	630	2,757	83	359		

TECHNOLOGY

An intensive study was made of blast-furnace slag cement and the results were published. The authors concluded that a basic slag, properly granulated, dried, and ground with activators will make a good hydraulic cement.[4]

According to a recent report, aged linseed oil with a specific gravity of 0.948–0.953 is a generally more satisfactory dispersing agent than oleic acid in the turbidimetric determination of specific surface of portland cement.[5]

Announcement was made of a mechanical method of determining time of set of portland cement. This apparatus, named a "spissograph," is a Vicat with a modified plunger and needle. It relieves the operator of the need of frequent checking and eliminates much of the human factor in the time-of-set test. The new mortar-setting test, as proposed by ASTM, is reported to be readily adapted to the spissograph.[6]

The National Bureau of Standards, United States Department of Commerce, has devised an analytical procedure using flame photometry to replace gravimetric methods in the determination of sodium and potassium oxides in portland cement.[7] Another development of the National Bureau of Standards was a rapid test for measuring sulfate susceptibility of portland cement.[8]

ASTM Committee C–1 on Cement issued a report on the optimum gypsum content of portland cement. Highlight of the Committee's conclusions was that specifications should permit higher SO_3 than now allowed, with increases of 1 to 2 percent in present limits. There is said to be little danger of excessive expansion unless the optimum amount is greatly exceeded.[9]

Other papers published included studies of the effect of gypsum content on compressive strength of cements,[10] and the use of calcium chloride in the reduction of alkalies in portland cement.[11]

---

[4] Brothers, J. A., and Foran, M. R., Blast-Furnace Slag Cement: Canadian Min. and Met. Bull., vol. 43, No. 462, October 1950, pp. 569–579.

[5] McCoy, W. J., and Caldwell, A. G., Aged Linseed Oil as Dispersing Agent in Portland-Cement Analysis: Rock Products, vol. 53, No. 5, May 1950, pp. 84–85, 102.

[6] Glantz, O. J., and Halsted, L. E., Mechanically Determining the Time of Set of Portland Cement by Means of the Spissograph: Am. Soc. Testing Materials Bull. 170, December 1950, pp. 79–81.

[7] Rock Products, vol. 53, No. 5, May 1950, p. 57.

[8] Pit and Quarry, vol. 43, No. 5, November 1950, p. 78.

[9] Meissner, H. S., Chairman, ASTM Committee C–1 on Cement, Am. Soc. Testing Materials Bull. 169, October 1950, pp. 39–45.

[10] Rutle, J., Effect of Gypsum Content on Compressive Strength of Cements: Pit and Quarry, vol. 43, No. 1, July 1950, pp. 87–88, 97.

[11] Holden, E. R., Reduction of Alkalies in Portland Cement: Use of Calcium Chloride: Ind. Eng. Chem. vol. 42, No. 2, February 1950, pp. 337, 341.

232294—53——16

WORLD REVIEW

Available statistics on world production of cement in 1945–50 are shown in the following table:

TABLE 33.—World production of hydraulic cement, by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
North America:						
Canada	1, 344, 934	1, 835, 302	1, 894, 956	2, 242, 773	2, 526, 858	2, 646, 809
Cuba	217, 399	267, 638	276, 369	284, 954	312, 290	316, 251
Dominican Republic	----------	----------	16, 800	43, 452	53, 561	70, 443
Guatemala	[2] 29, 000	[2] 29, 000	27, 600	31, 573	35, 852	41, 610
Mexico	740, 400	738, 000	707, 800	833, 444	1, 227, 600	1, 522, 800
Nicaragua	[2] 16, 000	9, 975	15, 959	16, 220	16, 462	16, 512
Panama	----------	----------	----------	41, 300	53, 600	50, 971
United States	17, 786, 688	28, 403, 616	32, 314, 655	35, 626, 454	36, 312, 780	39, 273, 486
South America:						
Argentina	1, 087, 578	1, 140, 529	1, 363, 400	1, 251, 770	1, 452, 000	1, 560, 000
Bolivia	27, 174	30, 742	38, 828	39, 130	41, 546	(3)
Brazil	774, 378	826, 382	913, 525	1, 111, 503	1, 281, 047	1, 381, 976
Chile	411, 088	579, 906	602, 299	539, 789	495, 208	512, 848
Colombia	302, 598	332, 265	346, 227	363, 749	474, 726	579, 977
Ecuador	37, 504	38, 497	33, 231	40, 369	52, 250	57, 607
Peru	264, 892	260, 617	255, 644	282, 373	280, 500	331, 297
Uruguay	216, 592	272, 490	280, 831	287, 466	293, 377	304, 512
Venezuela	115, 784	128, 329	145, 881	214, 513	285, 000	501, 006
Europe:						
Austria	(3)	387, 680	281, 271	721, 379	1, 091, 012	1, 280, 400
Belgium	646, 898	1, 889, 777	2, 609, 174	3, 330, 948	2, 924, 998	3, 557, 231
Bulgaria	245, 100	(3)	(3)	[2] 325, 000	(3)	(3)
Czechoslovakia	(3)	920, 000	1, 404, 000	1, 650, 000	1, 738, 000	(3)
Denmark	219, 996	501, 835	633, 560	769, 064	834, 000	873, 000
Finland	277, 679	329, 792	417, 737	555, 800	655, 984	743, 000
France	1, 576, 963	2, 116, 428	3, 920, 829	5, 067, 855	6, 443, 352	7, 208, 400
Germany:						
Federal Republic	(3)	2, 595, 600	2, 996, 200	5, 581, 200	8, 460, 000	10, 877, 000
Soviet Zone		(3)	(3)	765, 000	1, 000, 000	(3)
Greece	55, 000	103, 000	182, 000	288, 000	[2] 326, 000	(3)
Hungary	[4,5] 38, 280	163, 590	209, 060	[2] 145, 000	[2] 640, 000	(3)
Ireland	192, 000	300, 000	291, 000	398, 000	[2] 453, 000	(3)
Italy	1, 143, 069	2, 019, 000	2, 754, 091	3, 143, 808	4, 036, 501	5, 003, 546
Luxembourg	50, 000	75, 100	89, 272	102, 000	121, 000	125, 000
Netherlands	231, 000	402, 654	519, 262	588, 997	552, 032	592, 800
Norway	141, 800	436, 211	472, 612	526, 187	592, 184	583, 200
Poland	[6] 300, 906	1, 398, 915	1, 521, 822	1, 823, 857	2, 200, 000	2, 376, 000
Portugal	262, 980	326, 400	427, 734	498, 069	521, 435	572, 549
Rumania	250, 000	315, 000	422, 000	452, 000	560, 000	650, 000
Spain	1, 926, 052	2, 145, 140	2, 186, 338	2, 330, 850	2, 247, 608	2, 521, 107
Sweden	1, 213, 513	1, 461, 726	1, 550, 103	1, 486, 450	1, 698, 369	1, 944, 000
Switzerland	415, 000	694, 000	994, 790	[2] 1, 000, 000	[2] 950, 000	1, 078, 000
U. S. S. R.[2]	1, 800, 000	3, 400, 000	4, 800, 000	6, 600, 000	8, 000, 000	10, 500, 000
United Kingdom	4, 121, 100	6, 681, 545	7, 071, 708	8, 656, 700	9, 364, 000	9, 912, 600
Yugoslavia	134, 000	586, 092	1, 233, 180	1, 188, 000	[2] 1, 300, 000	(3)
Asia:						
China	42, 500	208, 057	608, 692	(3)	[7] 218, 000	[7] 430, 000
Taiwan (Formosa)[2]				235, 000	280, 800	332, 000
Hong Kong	(3)	(3)	34, 220	53, 200	58, 700	68, 400
India [8]	2, 180, 443	1, 969, 387	1, 470, 895	1, 577, 831	2, 135, 737	2, 652, 000
Indochina	4, 910	36, 430	39, 871	97, 259	154, 000	144, 000
Indonesia	(3)	(3)	10, 000	37, 751	(3)	(3)
Iran [9]	[10] 25, 000	42, 700	[10] 42, 714	64, 795	58, 500	64, 000
Iraq	----------	----------	----------	----------	7, 007	66, 051
Israel	147, 237	265, 935	328, 394	159, 865	241, 393	380, 128
Japan	1, 172, 273	929, 000	1, 236, 000	1, 848, 000	3, 274, 572	4, 458, 000
Korea:						
North	133, 700	[2] 150, 000	[2] 150, 000	(3)	(3)	(3)
South	5, 350	10, 696	18, 191	17, 350	24, 132	(3)
Lebanon	148, 471	144, 000	167, 116	208, 800	233, 000	263, 197
Pakistan	(11)	(11)	(11)	327, 168	431, 000	(3)
Philippines	[5] 27, 231	56, 261	133, 918	120, 384	201, 089	292, 051
Syria	34, 728	43, 500	48, 200	54, 400	57, 800	67, 800
Thailand	(3)	(3)	58, 800	82, 800	127, 200	165, 600
Turkey	288, 455	323, 219	350, 456	344, 924	372, 584	386, 813

See footnotes at end of table.

TABLE 33.—World production of hydraulic cement, by countries,[1] 1945–50, in metric tons—Continued

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Africa:						
Algeria	105,035	115,410	127,815	129,867	128,075	322,071
Belgian Congo	76,264	81,514	115,441	[2] 126,942	[2] 156,914	[2] 186,519
Egypt	432,098	587,577	648,353	768,283	[2] 800,000	[2] 1,000,000
Ethiopia [2]	(3)	(3)	(3)	8,000	8,000	(3)
French Morocco	76,835	175,180	218,877	262,232	264,000	321,000
Mozambique	33,919	26,275	35,858	37,207	45,841	(3)
Southern Rhodesia	69,400	66,400	71,200	69,000	(3)	(3)
Tunisia	59,600	83,540	115,100	161,700	167,631	169,200
Union of South Africa	1,050,000	1,180,200	1,251,743	1,308,000	1,363,200	1,846,800
Oceania:						
Australia [12]	704,400	734,400	896,400	1,029,600	1,047,600	1,177,200
New Zealand	237,600	229,900	219,409	247,205	254,039	255,528
Total [13]	49,500,000	72,500,000	85,400,000	101,500,000	114,600,000	131,500,000

[1] In addition to countries listed, hydraulic cement is produced in Albania, Eritrea, and Madagascar, but data are not available (*see* footnote 13).
[2] Estimate.
[3] Data not available; estimate by senior author of chapter included in total.
[4] Data represent Trianon Hungary after October 1944.
[5] June to December, inclusive.
[6] April to December, inclusive.
[7] Manchuria only.
[8] Beginning September 1947, excludes Pakistan.
[9] Fiscal year ended Mar. 20 of year following that stated.
[10] Production in Government-operated plants only.
[11] Included in India.
[12] Fiscal year ended June 30 of year stated.
[13] Estimated by senior author of chapter; excludes estimates for countries listed in footnote 1 as production in those countries is believed to be negligible.

Chromium

By Norwood B. Melcher and Jachin M. Forbes

GENERAL SUMMARY

WORLD producers of chromite began 1950 with operations at a generally low level, and some marginal mines were shut down temporarily awaiting a more favorable market. The United States, as the largest consumer, had nearly a year's supply on hand in industry stocks, and imports had dropped 22 percent during 1949. Prospects were not encouraging for a good year in the chromite-mining industry. However, United States business and industry began to revive early in 1950; and consumption of raw materials, including chromite, continued to increase throughout the remainder of the year. The outbreak of hostilities in Korea in June and the passage of the Defense Production Act of 1950 gave a tremendous impetus to raw material consumption and resulted in the highest annual chromite consumption on record.

TABLE 1.—Salient statistics of chromite in the United States, 1945–50, in short tons

	1945	1946	1947	1948	1949	1950
Total supply	[1] 939,860	761,498	1,107,128	1,545,744	[2] 1,204,285	1,304,117
Imports for consumption	[1] 925,887	757,391	1,106,180	1,542,125	[2] 1,203,852	1,303,713
Domestic production	13,973	4,107	948	3,619	433	404
Consumption by industry	808,120	734,759	833,357	875,033	672,773	980,369
Exports	12,366	2,158	3,435	2,894	2,382	2,044

[1] Corrected figure. Imports for consumption erroneously carried in 1948–49 volumes as 914,765 tons.
[2] Revised.

The supply of chromite in 1950, virtually all from foreign sources, failed to keep pace with demand although total imports increased 8 percent over 1949. Difficulties in transportation were becoming apparent before the close of 1950 that foreboded serious supply problems as the rearmament program gathered momentum. A particularly difficult situation developed in connection with the movement of chromite from the Transvaal, Union of South Africa. This ore is shipped out of Lourenço Marques, Mozambique, and in the late months of 1950 a large tonnage of low-grade material destined for Europe accumulated on the docks and congested port traffic. Railway officials diverted cars serving the mines to other commodities, with the result that shipments of chromite to the United States were hampered by a lack of railroad cars, as well as bottoms. Since South Africa is now the only source of chemical-grade ore, it was apparent that emergency arrangements for additional shipping space would be necessary if the supply from this source were to be maintained. As world trade expanded in response to rearmament of the Western Powers, shipping facilities were also increasingly difficult to obtain for chromite from other sources, indicating that future chromite supply would be primarily a problem of transportation rather than expansion of mining operations.

The Union of South Africa displaced Turkey as the principal supplier of chromite to the United States in 1950. Of the 1,303,713 short tons received, the Union of South Africa furnished 354,706 tons, or 27 percent, most of it chemical-grade ore. Turkey was in second position, with 20 percent of the total, although most was high-grade metallurgical ore. The Republic of the Philippines dropped back to third place in 1950 with 16 percent, two-thirds of which was refractory-grade ore. Imports from this source were reduced 22 percent below the 1949 level. Southern Rhodesia nearly doubled the 94,239 tons shipped to the United States in 1949, moving into fourth place with 13 percent of total imports, the bulk of this being metallurgical-grade ore. Cuba was an important supplier of refractory-grade ore; including 13,385 tons of metallurgical ore, the 106,052 tons imported from this source represented 8 percent of the total. Imports from Russia declined again in 1950; the 71,556 tons of metallurgical-grade ore was 33 percent lower than in 1949 and 82 percent lower than in 1948. New Caledonia supplied significant quantities of chromite in 1950, and small shipments were received from Canada, Guatemala, India, Italy, Pakistan, Sierra Leone, and Yugoslavia.

DOMESTIC PRODUCTION

United States production of chromite was reduced to the output of one mine in 1950. R. F. Helmke reported 404 short tons of metallurgical chromite produced and shipped from the Lambert mine near Magalia, Calif.

Bureau of Mines laboratory research teams developed a process to produce electrolytic chromium metal from low-grade domestic ores; and, at the end of 1950, prospects favored commercial operation in the near future. The results of earlier studies in the metallurgy of chromium were published.[1] Field exploration of the large, low-grade chromite deposits of the Stillwater complex in Montana was completed, and tentative plans were set up for emergency development. Other domestic reserves were reviewed by the Bureau of Mines, Defense Minerals Administration, and the United States Geological Survey.

TABLE 2.—Chromite production (shipments) in the United States, 1946–50, by States, in short tons

State	1946	1947	1948	1949	1950
California	[1] 4,107	948	274	433	404
Oregon			3,345		
Total	4,107	948	3,619	433	404

[1] Bureau of Mines not at liberty to publish State totals separately.

[1] Kroll, W. S., Hergert, W. F., and Carmody, W. R., Contribution to the Metallurgy of Chromium: Bureau of Mines Rept. of Investigations 4752, 1950, 19 pp.

TABLE 3.—Chromite shipped from mines in the United States, 1880–1950 [1]

Year	Short tons	Year	Short tons	Year	Short tons	Year	Short tons
Before 1880	224,000	1897–99	----	1917	48,972	1935	577
1880	2,563	1900	157	1918	92,322	1936	301
1881	2,240	1901	412	1919	5,688	1937	2,600
1882	2,800	1902	353	1920	2,802	1938	909
1883	3,360	1903	168	1921	316	1939	4,048
1884	2,240	1904	138	1922	398	1940	2,982
1885	3,024	1905	25	1923	254	1941	14,259
1886	2,240	1906	120	1924	323	1942	112,876
1887	3,360	1907	325	1925	121	1943	160,120
1888	1,680	1908	402	1926	158	1944	45,629
1889	2,240	1909	670	1927	225	1945	13,973
1890	4,031	1910	230	1928	739	1946	4,107
1891	1,537	1911	134	1929	301	1947	948
1892	1,680	1912	225	1930	90	1948	3,619
1893	1,624	1913	286	1931	300	1949	433
1894	4,122	1914	662	1932	174	1950	404
1895	1,949	1915	3,675	1933	944		
1896	880	1916	52,679	1934	413	Total	848,556

[1] Production of chromite before 1880 was "about 200,000 long tons" (224,000 short tons), all from Maryland and Pennsylvania, according to Mineral Resources, 1908, pt. 1, p. 760. Most of the figures for 1880–95 represent conversions to short tons from rounded long tons.

CONSUMPTION AND USES

Chromite consumption during 1950 increased 46 percent above 1949 to the all-time high of 980,369 short tons. Consumption rose rapidly during the year, each quarterly total exceeding the preceding one. However, a shipping shortage was developing at the close of the year, which threatened to curtail imports, especially those from Africa.

Of the chromite consumed in 1950, 50 percent was metallurgical grade, which increased 70 percent over 1949; 36 percent was refractory grade, which increased 32 percent over 1949; and 14 percent was chemical grade, which increased 17 percent over 1949. Of the three grades, only the refractory consumption established a new high; the metallurgical total had been exceeded in 1943 and the chemical total in 1947 and 1948. The average chromic oxide content of all grades combined increased from 41.3 percent in 1949 to 42.4 percent in 1950.

TABLE 4.—Consumption of chromite and tenor of ore used by primary consumer groups in the United States, 1941–50, in short tons

Year	Metallurgical		Refractory		Chemical		Total	
	Gross weight (short tons)	Average percent Cr_2O_3	Gross weight (short tons)	Average percent Cr_2O_3	Gross weight (short tons)	Average percent Cr_2O_3	Gross weight (short tons)	Average percent Cr_2O_3
1941	402,208	50.1	270,947	34.8	127,135	46.3	800,290	44.3
1942	479,615	48.5	294,092	34.0	118,245	44.8	891,952	43.2
1943	555,259	48.5	282,178	34.0	127,163	44.7	964,600	43.8
1944	456,171	49.4	264,053	34.2	128,225	45.7	848,449	44.1
1945	429,644	49.1	252,407	34.2	126,069	45.0	808,120	43.8
1946	376,848	48.3	228,641	33.9	129,270	44.9	734,759	43.2
1947	385,983	47.4	311,018	35.2	136,356	44.7	833,357	41.1
1948	395,417	48.2	327,795	33.8	151,821	45.5	875,033	42.7
1949	288,518	47.6	268,925	33.5	115,330	44.1	672,773	41.3
1950	491,685	47.8	353,642	34.0	135,042	44.6	980,369	42.4

Consumption of ferrochromium in the United States in 1950 increased 69 percent to 147,911 tons, compared with 87,764 tons in 1949 and 122,753 tons in 1948. Additional tonnages of chromium were consumed in the form of chromium metal, briquets, Chrom-X, and some chromite used directly in the manufacture of stainless steel.

Specifications.—The mineral chromite does not have a fixed chemical composition. It is usually spoken of as $Cr_2O_3 \cdot FeO$ but also contains varying proportions of iron, alumina, magnesia, lime, and silica. These additional elements, although lowering the grade of the material in terms of chromium content, are essential to certain applications, as may be seen from the usual trade specifications outlined below.

For metallurgical use, as in the manufacture of ferrochromium, chromite should contain a minimum of 48 percent Cr_2O_3, with a chromium : iron ratio of not less than 3 : 1. Silica is undesirable, and combined alumina and magnesia of over 25 percent may be objectionable. However, ore of these specifications is not always obtainable, and the practice is to blend various analyses so that the most desirable composition will result in the furnace charge. Thus, an ore of high Cr_2O_3 content and high-iron content might be blended with chromite of somewhat lower Cr_2O_3 and an exceptionally low-iron content; together the ratio might be acceptable. Similar blending is practiced to attain the desired physical characteristics. For high-carbon ferrochromium, hard lumpy ore is desired, and for low-carbon grades, a crushed ore is preferable.

Refractory-grade chromite usually contains about 63 percent combined Cr_2O_3 and Al_2O_3, with 57 percent a common minimum. Iron and silica should be low, usually around 10 and 5 percent, respectively. Hard lump ore is desirable for making bricks, and ground material is suitable for cement. Magnesia content is around 15 percent.

Chemical-grade chromite should contain a minimum of 45-percent Cr_2O_3. High iron is not harmful within reasonable limits; a common chromium : iron ratio is 1.6 : 1. Silica must be less than 8 percent and sulfur low. Fines and concentrates are often preferred because they disintegrate readily in processing.

Metallurgical Uses.—To the general public, the most apparent use of chromium is for decorative electroplated finishes. However, these finishes are usually 0.00001 to 0.00005 inch thick and, in the aggregate, consume insignificant quantities of chromium. Heavy electroplating has important military uses, however.

It is generally known that chromium is an important constituent of stainless steel, in which a large proportion of the available chromium is consumed as low-carbon ferrochromium. Stainless steel, in turn, has many essential uses, such as chemical containers, equipment for manufacturing chemicals, marine parts, turbine blades, valve steel, petroleum-processing equipment, and numerous other applications where the metal is subjected to corrosive attack. When chromium is used in plain carbon steel for purposes other than corrosion resistance, the principal effects are to increase hardness and tensile strength with high ductility, thus permitting heat treatment of many products that must be shaped by rolling and forging. Small percentages of chromium are used in a wide variety of special steels; and, in fact, chromium is the most commonly used of all the alloying agents.[2]

[2] Manganese and silicon, although used in larger quantities, are employed mainly in production metallurgy, rather than as alloying elements.

This fact derives principally from the property of chromium to intensify and sometimes modify the effects of other alloys, an influence that metallurgical studies indicate is due to a reduction in the rate of reaction in and between the components of the steel during heat treatment.

Nonferrous uses of chromium are also expanding, especially for the purpose of increasing strength and resistance to the effects of high temperatures in alloys of aluminum and copper.

Chromium additions are made to steel in the furnace, and in the ladle before final solidification. For steel requiring low carbon content, a low-carbon ferrochromium is used; for other steels, a less expensive ferrochromium containing up to 10 percent carbon may be used. Where the metal is to receive chromium plus other alloying agents, several special combinations with other alloys have been made available in correct proportions for single additions. Nonferrous uses require chromium metal or combinations of chromium with copper.

Refractory Uses.—Chromite from the Philippines, Cuba, and (in smaller quantities) from other sources is suitable for use as a neutral lining for furnaces. Most of the ore is manufactured into bricks, and the greater part of these bricks is used in basic open-hearth steel furnaces. Because chromite refractories resist both acid and basic attacks at high temperatures, it is common practice to use a course of chromite bricks near the slag line in open-hearth furnaces, separating the silica bricks of the roof and side and the dolomite or magnesite bricks of the hearth and banks. Other chrome refractory uses have been developed in recent years, among which are ramming mixtures for furnace bottoms and finely ground chrome ore for patching furnace walls.

Chemical Uses.—The largest uses for chemical chromite are in the manufacture of pigments and the tanning of leather; surface treatment of metals represents the next-most-important use. In all chemical uses, sodium bichromate is the primary chemical produced from chromite. Chromium metal, although a metallurgical material, is also produced from chemical-grade chromite with sodium bichromate as the intermediate product. The metal is finding substantial markets in the production of high-temperature alloys, such as are used in engines for jet aircraft, and for antifriction purposes, where it is deposited by electrolytic methods. In the third-largest use mentioned (surface treatment of metals), sodium bichromate is used as the agent in cleansing, pickling, galvanizing, and red dip for brass.

STOCKS

TABLE 5.—Stocks of chromite at consumers' plants, December 31, 1947–50, in short tons

Grade	1947	1948	1949	1950
Metallurgical	191,104	256,770	325,881	248,872
Refractory	144,381	236,724	303,110	251,663
Chemical	75,582	108,997	128,004	105,736
Total	411,067	602,491	756,995	606,271

PRICES

Imported chromite is quoted on a long-ton basis, f. o. b. cars, Atlantic ports, plus ocean-freight differentials for delivery to the west coast. Domestic chromite is sold f. o. b. nearest rail point. Price quotations from the magazine Steel are shown in table 6.

TABLE 6.—Price quotations for various grades of chromite in 1950

[Steel]

Source	Cr_2O_3 (percent)	Cr:Fe ratio	Prices per long ton [1]	
			Jan. 1	Dec. 31
Indian and African	48	3:1	\$37.50	\$35.00-\$36.00
Do	48	2.8:1	35.00	32.50
Do	48		\$28.50-29.00	26.00
South African (Transvaal)	50		28.50-29.00	28.00-28.50
Do	48		27.00-28.00	27.00
Do	45		19.50-21.00	20.00
Do	44		19.00-20.00	19.50
Rhodesian	48	[2] 3:1	37.50	35.00-36.00
Do	48		28.00-29.00	26.00
Do	45		20.00-21.00	20.00-21.00
Brazilian	44	[2] 2.5:1	[3] 32.00	32.00
Domestic (sellers nearest rail)	48	3:1	39.00	39.00

[1] For foreign ore, f. o. b. cars, New York, Philadelphia, or Charleston to which is to be added ocean freight differential for delivery to west coast ports. For domestic ores, f. o. b. nearest rail point.
[2] Lump.
[3] Nominal.

Ferrochromium prices held firm at the 1949 level of 20.5 cents per pound of contained chromium for high-carbon grades through October 1950. In November the price rose to 21.75 cents and remained there through the end of the year. Low-carbon ferrochromium rose from 28.75 cents per pound to 30.5 cents at the end of 1950. Chromium metal (97 percent Cr min., 1 percent Fe, and 0.50 percent C max.) rose from \$1.03 per pound to \$1.08. The prices for metal and alloys given here are for bulk, carlots. Basic chrome-brick prices advanced from \$69 per short ton to \$77 f. o. b. Baltimore, Md., or Chester, Pa.

FOREIGN TRADE [3]

Imports of chromite in 1950 increased 8 percent over 1949 to a total of 1,303,713 short tons containing 581,804 tons of Cr_2O_3, valued at \$23,288,336. Average declared value per ton decreased 11 percent from \$20.10 in 1949 to \$17.86 in 1950.

Imports of ferrochromium in 1950 more than tripled the 1949 total, reaching 23,126 short tons containing 13,768 tons of Cr and valued at \$4,530,247. Canada supplied 21,419 tons; Japan, 770 tons; Sweden, 736 tons; Yugoslavia, 109 tons; Norway, 52 tons; and France, 40 tons. In addition, 59 tons of chromium metal were imported from Norway and the United Kingdom.

Exports of ferrochromium were reduced from 2,200 short tons in 1949 to 347 tons in 1950. Austria received 223 tons, Canada 62 tons, and Mexico 51 tons, while the remaining 11 tons went to the Canal

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Zone, Italy, and Turkey. Chromic acid exports totaled 629,055 pounds valued at $146,499. Chromite exports in 1950 were 2,044 short tons valued at $63,409, of which 1,697 tons went to Canada.

TABLE 7.—Chromite imported for consumption in the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	1949			1950		
	Short tons		Value	Short tons		Value
	Gross weight	Cr_2O_3 content		Gross weight	Cr_2O_3 content	
Canada				851	409	$31,152
Cuba	91,369	32,221	$1,196,214	106,052	38,143	1,485,662
Guatemala				784	423	35,000
India	8,095	3,837	163,807	1,979	952	63,382
Italy				2	1	20
Mozambique [1]				27,797	12,228	221,089
New Caledonia [2]	70,009	36,969	[3] 1,770,072	64,674	33,822	1,458,662
Pakistan				8,956	4,471	167,791
Philippines	272,970	102,008	3,172,521	211,996	79,511	2,352,061
Sierra Leone [4]	10,304	4,122	174,000	11,008	5,278	289,387
Southern Rhodesia	94,239	44,531	[3] 2,038,626	172,754	82,085	3,363,153
Turkey	[3] 275,746	[3] 131,574	[3] 8,823,127	260,311	123,702	8,041,907
Union of South Africa	263,898	[3] 120,542	2,604,954	354,706	161,093	3,370,919
U. S. S. R.	107,131	51,424	3,932,975	71,556	34,795	2,172,578
Yugoslavia	10,091	4,844	323,828	10,287	4,891	235,573
Total	[3] 1,203,852	[3] 532,072	[3] 24,200,124	1,303,713	581,804	23,288,336

[1] Reported as Mozambique, but the chromite is believed to have originated in the Union of South Africa.
[2] Presumed origin; actually classified as French Pacific Islands.
[3] Revised figure.
[4] Presumed origin; actually classified as British West Africa.

WORLD REVIEW

Cuba.—Cuban chromite mines, supported by a strong United States market, recovered from a drastic production slump and increased shipments to the United States in 1950. A moderate further increase may be expected from this important supplier of refractory-grade ore with the continued stimulus of higher prices. However, an exploration program to develop new reserves is needed.

New Caledonia.—This source supplied 10 percent of United States metallurgical-grade chromite imports in 1950. In 1949, New Caledonia exported 102,414 metric tons, of which 63,511 tons entered the United States.[4]

Pakistan.—Production of chromite in Baluchistan since 1915 is given in a report, Mining Industry in Pakistan, published by the Pakistan Ministry of Industries. A peak of 39,344 long tons was produced in fiscal year 1942, compared with only 15,673 tons in 1949. Of the 106 chromite leases, the Baluchistan Chrome Co., Ltd., has been granted 97. Pakistan Industries also has shown interest in chromite mining and has applied for a number of prospecting licenses. A few of these licenses have been granted; as a result, the company has started mining operations.[5]

[4] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, pp. 6–7.
[5] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 4, October 1950, p. 7.

TABLE 8.—World production of chromite, by countries, 1943–50, in metric tons

[Compiled by Pauline Roberts]

Country	1943	1944	1945	1946	1947	1948	1949	1950
North America:								
Canada	26,848	24,543	5,221	2,821	1,961	1,556	347	(1)
Cuba	354,152	192,131	172,626	174,350	159,209	116,624	97,368	[2] 117,358
Guatemala	374	97	443	610	625	474	300	300
Mexico	-----	-----	(3)	-----	-----	-----	-----	-----
United States	145,259	41,394	12,676	3,726	860	3,283	393	367
South America:								
Argentina	250	181	3,000	-----	-----	-----	(1)	(1)
Brazil (exports)	7,813	4,721	1,490	174	-----	1,626	3	(1)
Europe: [4]								
Albania	[5] 31,091	-----	-----	-----	-----	[6] 16,500	(1)	(1)
Bulgaria	5,000	5,000	-----	-----	(1)	(1)	(1)	(1)
Greece	15,500	18,295	2,413	9,062	2,640	1,500	3,381	12,631
Portugal	1,267	1,111	1,669	1,530	533	440	[7] 500	(1)
Sweden	224	127	-----	-----	-----	-----	-----	(1)
United Kingdom	294	116	-----	-----	-----	(1)	(1)	(1)
Yugoslavia [7]	65,000	10,000	6,000	68,000	55,000	65,000	93,000	100,000
Asia:								
Cyprus (exports)	7,986	469	1,070	1,158	5,283	6,899	14,875	(1)
India	[9] 33,789	[9] 40,190	[9] 31,642	[9] 45,511	35,274	22,917	19,728	(1)
Indochina	6,510	2,300	-----	-----	-----	-----	-----	(1)
Iran [8]	1,267	12	-----	-----	(1)	(1)	(1)	(1)
Japan	58,520	71,135	28,539	7,079	2,407	9,340	27,003	31,953
Pakistan	(9)	(9)	(9)	(9)	22,040	18,160	15,925	[7] 18,000
Philippines	[7] 60,000	[7] 70,000	(1)	58,930	195,185	256,854	246,744	250,511
Turkey	154,512	182,108	146,716	103,167	102,875	285,353	434,117	350,000
U. S. S. R. [4] [7]	325,000	300,000	300,000	300,000	500,000	600,000	350,000	500,000
Africa:								
Egypt	910	150	150	-----	266	191	50	(1)
Sierra Leone	16,306	9,851	578	10,301	16,769	7,886	22,101	(1)
Southern Rhodesia	287,453	277,051	186,318	151,433	155,149	230,703	243,506	291,525
Union of South Africa	163,232	88,909	99,090	212,253	373,094	412,783	404,351	496,324
Oceania:								
Australia	1,002	780	287	-----	-----	-----	(1)	(1)
New Caledonia	46,952	55,229	59,828	24,946	50,530	75,021	88,792	(1)
Total (estimate)	1,825,000	1,400,000	1,100,000	1,200,000	1,700,000	2,150,000	2,100,000	2,300,000

[1] Data not available; estimate by author of chapter included in total.
[2] Exports.
[3] Less than 1 ton.
[4] Output from U. S. S. R. in Europe included with U. S. S. R. in Asia.
[5] January to September, inclusive.
[6] Planned production as reported.
[7] Estimate.
[8] Fiscal year ended March 20 of year following that stated.
[9] Pakistan included with India, 1943–46.

Philippines.—As the third-largest supplier of chromite and particularly as the principal source of refractory-grade chromite, Philippine mines are important to the United States. However, lack of demand in 1949 and early 1950 caused a number of mines to shut down temporarily. From the standpoint of reserves, the Philippines could advance in relative importance as a chromite supplier.

Southern Rhodesia.—It was announced officially that a plant to produce ferrochromium will be constructed in the industrial area of Gwelo, Southern Rhodesia. Rhodesian Alloys, Ltd., sponsored by the British firm of John Brown & Co., Ltd., British South Africa Co., and Anglo-American Corp. of South Africa Co., Ltd., is financed to £1,000,000 and expects to begin production in 1952. Expansion will depend upon operating and marketing experience gained. The Selukwe district will supply chrome ore.[6]

Turkey.—Economic Cooperation Administration funds are being made available to Turkey, considerable emphasis being placed on

[6] South African Mining and Engineering Journal, vol. 61, part I, No. 2988, May 20, 1950, p. 409.

expansion of the chromite-mining industry. The Turkish Government-owned Eti Bank, which controls the chromite mines in the Guleman area, 18 kilometers north of Erganimadeni,[7] is engaged in an expansion program. The area produces some of the highest-grade chrome (52 percent Cr_2O_3) in the world, with ore reserves of over 1,000,000 tons. Production from this area in 1950 is estimated at 160,000 tons of metallurgical grade. Bilgin Maadin, Ltd., also is expanding and mechanizing operations at its properties in the Islahiye district in south central Turkey. Turk Maadin, Ltd., which operates the Kavek mine and concentrating plant east of Eskisehir, is undertaking to develop a number of promising ore bodies in the Oatmanlar district in the Department of Mugla, southwest Turkey. Production plans for this development call for an annual output of 20,000 tons of metallurgical-grade chrome ore. The Turkish Government plans a complete survey of the Taurus Mountain zone, where important chromite deposits have been reported.[8]

Chromite occurrences in the Tastepe district of Eskisehir, Turkey, were described.[9] Exports of chromite from Turkey in recent years are listed in table 9.

TABLE 9.—Exports of chromite from Turkey, by destination, 1935–39 (average) and 1947–49, in metric tons [1]

Destination	1935-39 (average)	1947	1948	1949
Austria	(2)	3,395	21,958	37,324
Belgium	(2)			390
Canada	(2)		1,118	
Czechoslovakia	720		940	
France	17,272	32,632	24,596	17,676
Germany (Western)	67,180			8,196
Hungary	(2)			3,452
Italy	12,619	7,925	1,509	5,750
Norway	(2)	25,581	7,245	500
Sweden	34,716	44,650	2,681	16,280
Switzerland	210			50
United Kingdom	2,310	4,449	6,385	11,017
United States	22,803	65,146	239,675	252,610
Other	21,114			
Total	178,944	183,778	306,107	353,245

[1] United States consular report 34, Ankara, May 5, 1949.
[2] Included with "Other."

Union of South Africa.—Large reserves of medium-grade chromite have placed the Union of South Africa in the lead as the largest producer outside of the U. S. S. R. The Union's ores suffer from a low chromium : iron ratio, which lessens its value for metallurgical uses. However, ores from the Union supply the bulk of the chromite used to manufacture sodium bichromate for chemical industry consumption. A discussion of the chromite-mining industry in the Union of South Africa was published.[10]

In the Transvaal, location of two high-grade seams of chrome ore, sufficient to keep its mine operating for 2 years, was reported by Palmiet Chrome Mines. A production of 2,600 tons of concentrates per month was expected.[11]

[7] Mining World, vol. 12, No. 13, December 1950, pp. 27-28.
[8] Mining World, vol. 12, No. 8, July 1950, p. 47.
[9] Mining Engineering, Trans. Am. Inst. of Min. & Met. Eng., vol. 187, No. 1, January 1950, pp. 108-110.
[10] South African Mining and Engineering Journal, vol. 61, part 1, No. 2979, Mar. 18, 1950, pp. 63-64.
[11] Mining World, vol. 12, No. 3, March 1950, p. 52.

Clays

By Brooke L. Gunsallus and V. E. Ritenour[1]

GENERAL SUMMARY

TOTAL clay production in 1950 increased 12 percent over 1949. Records were made in all of the six chief classifications discussed herein—china clay or kaolin, ball clay, fire clay, bentonite, fuller's earth, and miscellaneous clays.

Sales of kaolin and ball clay increased from 1949 to 1950 by 24 percent and 30 percent, respectively. The paper, rubber, pottery, and refractory industries, principal consumers of kaolin, all showed substantial increases. Production of kaolin has shown an uptrend since 1945. Sales of ball clay in 1950 broke all previous records, with pottery manufacturers by far the principal consumers. Whiteware, enameling, and high-grade tile showed increases in clay consumption over 1949.

TABLE 1.—Salient statistics of the clay industry in the United States, 1949–50

	1949		1950	
	Short tons	Value	Short tons	Value
Domestic clay sold or used by producers:				
Kaolin or china clay	1,415,537	$19,007,547	1,750,858	$23,943,782
Ball clay	248,883	3,064,439	324,414	3,980,167
Fire clay, including stoneware clay	8,571,844	25,358,503	9,535,867	29,019,372
Bentonite	867,243	6,938,752	973,833	8,560,669
Fuller's earth	320,906	5,199,642	396,025	6,504,733
Miscellaneous clays	23,725,565	19,622,568	26,400,449	23,241,210
Total sold or used by producers	35,149,978	79,191,451	39,381,446	95,249,933
Imports:				
Kaolin or china clay	77,226	1,156,803	122,974	1,619,384
Common blue and Gross Almerode	24,123	299,450	34,974	345,274
Fuller's earth	389	7,859	237	3,685
Other clay	3,367	17,287	3,076	32,534
Total imports	105,105	1,481,399	161,261	2,000,877
Exports:				
Kaolin or china clay	21,839	362,615	28,261	509,376
Fire clay	80,736	766,195	74,693	704,016
Other clay (including fuller's earth)	142,308	3,666,775	135,166	3,784,343
Total exports	244,883	4,795,585	238,120	4,997,735

Except for a small decrease in 1949, output of bentonite has increased each successive year for the past 12 years. From 1949 to 1950, tonnage increased 12 percent and value 23 percent. The foundry and petroleum industries consumed most of the total tonnage, with use for rotary-drilling mud, filtering and decolorizing oils, and foundry-sand bond all increasing.

[1] Figures oni mports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Total production of fuller's earth increased 23 percent in 1950 over 1949 and 18 percent over the previous record year 1930. Mineral-oil refining, absorbent uses, insecticides, and rotary-drilling mud were all represented in the upward trend.

The production of fire clay in 1950 was 11 percent greater than in 1949 due to the expansion of steel-mill and foundry facilities and the pent-up civilian and industrial demand for heavy clay products.

Price quotations of clay and clay products in 1950, as shown in trade papers, remained steady in most cases, but some followed a general uptrend.

Imports of kaolin in 1950 were the heaviest since 1937, increasing 59 percent over 1949, but comprised only 7 percent of the total domestic consumption. Imports of common blue and ball clays and Gross Almerode clays increased 45 percent in volume and 15 percent in value. By far the greater part of the imports of kaolin and ball clay, and blue clay (including Gross Almerode), originated in the United Kingdom, although small amounts of kaolin and common blue and ball clays were imported from Canada and a very small amount of the latter from Germany.

Exports of kaolin or china clay in 1950 (28,261 short tons) rose 29 percent over 1949; 90 percent was shipped to Canada. Exports of fire clay in 1950 were 7 percent in tonnage and 8 percent in value less than in 1949, totaling 74,693 short tons valued at $704,016. Of the total, 85 percent was shipped to Canada, the remainder being distributed throughout the world.

CONSUMPTION AND USES

The clay-consumption data in table 2 for kaolin, ball clay, bentonite, and fuller's earth are comparable with statistics published in Minerals Yearbook for all previous years. However, the fire-clay and miscellaneous clay data include captive tonnage and therefore are not comparable with the years preceding 1944. A discussion of this difference appeared in Minerals Yearbook, 1944 (pp. 1326–1338).

Heavy clay products in 1950 consumed 14 percent more clay than in 1949 and comprised 58 percent of the total clay produced. Clays used in portland and other hydraulic cements amounted to 18 percent of the output of all clays; refractories 14 percent; paper filler and coating clays 2 percent; and rotary drilling mud, filtering and decolorizing oils, and pottery, 1 percent each. The remainder was consumed for a large number of miscellaneous purposes.

Although most uses of clay increased in tonnage in 1950 compared with the previous year, the following uses decreased: Enameling (4 percent), architectural terra cotta (10 percent), asbestos products (28 percent), fertilizers (54 percent), and artificial abrasives (98 percent). Many uses showed substantial gains in 1950 over figures reported in 1949. The proportional increases for some of the more important classifications were as follows: Paper filler and coating 18 percent, heavy clay products 14 percent, pottery 23 percent, high-grade tile 35 percent, refractories 9 percent, rubber 21 percent, cement 6 percent, rotary-drilling mud 6 percent, and insecticides and fungicides 106 percent.

TABLE 2.—Clay sold or used by producers in the United States in 1950, by kinds and uses, in short tons

Use	Kaolin	Ball clay	Fire clay and stoneware clay	Bentonite	Fuller's earth	Miscellaneous clay, including slip clay	Total
Pottery and stoneware:							
Whiteware, etc.	137,215	248,899					386,114
Stoneware, including chemical stoneware	1,000	500	32,919			451	34,870
Art pottery and flower pots	4,130	6,225	33,415			24,739	68,509
Slip for glazing	900	100				1,489	2,489
Total	143,245	255,724	66,334			26,679	491,982
Tile, high-grade	28,573	38,228	147,536			13,287	227,624
Kiln furniture:							
Saggers, pins, stilts	7,777	1,720	17,809				27,306
Wads			2,018				2,018
Total	7,777	1,720	19,827				29,324
Architectural terra cotta		1,278	13,749				15,027
Paper:							
Filler	440,313						440,313
Coating	463,195						463,195
Total	903,508						903,508
Rubber	263,306		9,500			863	273,669
Linoleum	34,986		10,844				45,830
Paints:							
Filler or extender	14,962					1,380	16,342
Calcimine	1,321		286				1,607
Total	16,283		286			1,380	17,949
Portland and other hydraulic cements	65,430		4,898	6		7,009,687	7,080,021
Refractories:							
Firebrick and block	94,548	14,470	3,888,481			200	3,997,699
Bauxite, high-alumina brick			68,603				68,603
Fire-clay mortar, including clay processed for laying firebrick	51,787	1,240	260,330				313,357
Clay crucibles	577		485				1,062
Glass refractories	1,320		2,982				4,302
Zinc retorts and condensers			33,313				33,313
Foundries and steelworks	8,784	880	810,285	251,716	4	22,061	1,093,730
Other refractories			84,425			527	84,952
Total	157,016	16,590	5,148,904	251,716	4	22,788	5,597,018
Heavy clay products: Common brick, face brick, paving brick, drain tile, sewer pipe, and kindred products	82		4,020,357			18,629,219	22,649,658
Miscellaneous:							
Rotary-drilling mud			954	357,315	37,631	125,214	521,114
Filtering and decolorizing oils (raw and activated earths)				297,145	[1] 177,904		475,049
Other filtering and clarifying	29,548			2,457	4,663		36,668
Artificial abrasives	135		42				177
Absorbent uses (oily floors, etc.)					83,684		83,684
Asbestos products	2,447						2,447
Chemicals	22,434		89,892	1,799			114,125
Enameling	2,120	1,590					3,710
Fertilizers	4,742					1,500	6,242
Filler (other than paper or paint)	477	9,282			16,487	3,104	29,350
Insecticides and fungicides	41,346			3,848	69,928	780	115,902
Plaster and plaster products	7,960						7,960
Concrete admixture, sealing dams, etc.				1,694			1,694
Other uses	19,443	2	2,744	57,853	5,724	565,948	651,714
Total	130,652	10,874	93,632	722,111	396,021	696,546	2,049,836
Grand total:							
1950	1,750,858	324,414	9,535,867	973,833	396,025	26,400,449	39,381,446
1949	1,415,537	248,883	8,571,844	867,343	320,906	23,725,565	35,149,978

[1] Comprises the following: Mineral oils, 156,643 tons; vegetable oils, 21,261 tons.

CHINA CLAY OR KAOLIN

The 1950 domestic production of china clay or kaolin was the largest in the history of the industry and represented a 12-percent increase over the former record year 1948. With respect to 1949, there was a tonnage increase of 24 percent and a value increase of 26 percent. Thus there was a renewal of the upward trend in kaolin production that started in 1945.

As has been the pattern for the past several years, the paper, rubber, pottery and refractory industries were the principal consumers. Paper consumed 903,508 short tons, or 52 percent of the total kaolin, including 440,313 short tons for filler and 463,195 for coating. The rubber industry consumed 263,306 tons or 15 percent, refractories 157,016 tons or 9 percent, and pottery 143,245 tons or 8 percent. The remainder (16 percent) was consumed for a wide variety of purposes, including cement, high-grade tile, fertilizers, chemicals, insecticides, paint filler or extender, calcimine, and linoleum. Except for a few small consumers, substantial relative increases in consumption over 1949 were reported by all users, for example: Pottery 17 percent, paper filler 14 percent, paper coating 23 percent, rubber 33 percent, refractories 30 percent, paint filler 22 percent. The outstanding increase, 176 percent, was in insecticides.

TABLE 3.—Kaolin sold or used by producers in the United States, 1949–50, by States

State	Sold by producer		Used by producer		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Alabama, Florida, and North Carolina	52,703	$942,042			52,703	$942,042
California	(1)	(1)	(1)	(1)	16,068	397,800
Georgia	939,238	13,463,936	64,153	$342,400	1,003,391	13,806,336
Pennsylvania	(1)	(1)	(1)	(1)	52,478	201,576
South Carolina	(1)	(1)	(1)	(1)	274,458	3,488,054
Other States [2]	323,800	4,150,180	35,643	108,989	16,439	171,739
Total	1,315,741	18,556,158	99,796	451,389	1,415,537	19,007,547
1950						
Alabama, Florida, and North Carolina	59,049	1,163,079			59,049	1,163,079
California	(1)	(1)	(1)	(1)	22,657	309,995
Georgia	1,146,100	16,961,781	74,555	378,747	1,220,655	17,340,528
Pennsylvania	(1)	(1)	(1)	(1)	62,626	250,383
South Carolina	(1)	(1)	(1)	(1)	348,948	4,505,022
Other States [2]	430,593	5,311,841	40,561	128,334	36,923	374,775
Total	1,635,742	23,436,701	115,116	507,081	1,750,858	23,943,782

[1] Included with "Other States."
[2] Includes States indicated by footnote 1 and Illinois, Nevada (1950 only), Utah, and Virginia.

Eleven States shipped kaolin in 1950 compared with 10 in 1949, Nevada being added in 1950. As has been the case for a number of years, Georgia ranked first with 70 percent of the total, South Carolina was second with 20 percent, and Pennsylvania was third with 4 percent. All States or groups of States for which statistics are published in table 3 show substantial gains in output in 1950 compared to 1949.

TABLE 4.—Georgia kaolin sold or used by producers, 1946–50, by uses

Year	China clay, paper clay, etc.			Refractory uses			Total kaolin		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton		Total	Average per ton
1946	798,739	$9,075,123	$11.36	119,013	$595,926	$5.01	917,752	$9,671,049	$10.54
1947	902,554	12,034,383	13.33	129,459	721,658	5.57	1,032,013	12,756,041	12.36
1948	1,006,325	13,866,799	13.78	129,115	775,899	6.01	1,135,440	14,642,698	12.90
1949	902,433	13,229,888	14.66	100,958	576,448	5.71	1,003,391	13,806,336	13.76
1950	1,087,174	16,533,582	15.21	133,481	806,946	6.05	1,220,655	17,340,528	14.21

Quotations on Georgia kaolin, as reported in E&MJ Metal and Mineral Markets, for filler and ceramic grades were given in December 1950 as $8.50 to $9.50 per ton depending upon grade, for crushed material and $13 to $17 for pulverized, in paper bags. North Carolina china clays, ceramic grades in bulk, carlots, were quoted at $20.25 to $22.25 per ton. Florida kaolins were quoted by the same source at $18.75 per ton for purified and crushed; $24.75 for washed and air-floated clays; and $38.50 for air-floated enamel grade. Crude Pennsylvania kaolin was quoted at $5 to $7.50 per ton and "purified" kaolin at $21 to $24. These prices were substantially the same as those quoted in 1949.

Prices of imported china clay in December 1950 were quoted by the Oil, Paint and Drug Reporter as follows: White lump, carlots, ex dock (Philadelphia and Portland, Maine), $19 to $40 per long ton; powdered, ex dock, in bags, $35 to $45 per net ton; and powdered, l. c. l., ex warehouse, $45 to $60. There has been no change in price since October 1949. The average value of domestic kaolin sold or used as reported to the Bureau of Mines in 1950 rose to $13.68 compared with $13.43 for 1949 and $12.59 for 1948.

Imports of kaolin for 1950 increased 59 percent over 1949, although the imports represented only 7 percent of total domestic consumption in 1950 compared with 5 percent in 1949. Imports for 1950 were the largest since 1937, when they represented 17 percent of the total tonnage of kaolin consumed by industry in the United States. Of 1950 imports, totaling 122,974 short tons, 450 came from Canada and the remainder from the United Kingdom.

Exports of kaolin or china clay in 1950 rose 29 percent over 1949 to 28,261 short tons, of which 90 percent was shipped to Canada. Small tonnages also were sent to Mexico, Central and South America, Europe, Africa (Union of South Africa), Asia (Japan and Indonesia), and Australia.

A survey was made of the sedimentary kaolins of Georgia.[2] The versatility of kaolin has resulted in demands for widely varying refined-clay specifications, thus transforming what was once a rather simple mining operation into a highly scientific process requiring close laboratory control.[3] The use of kaolin as a catalyst is becoming more extensive.[4]

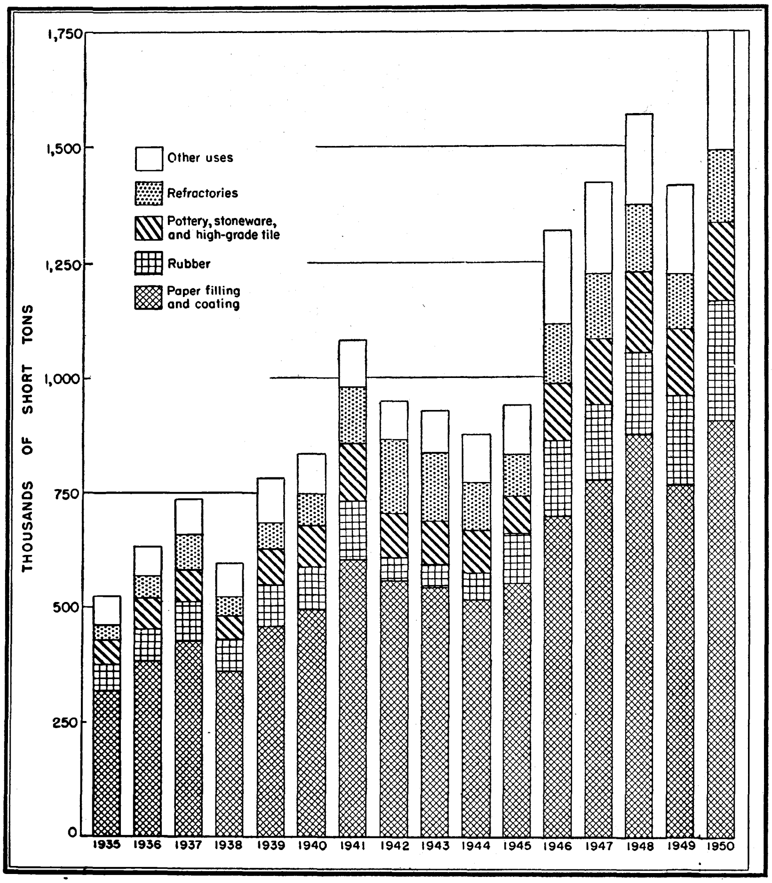

FIGURE 1.—Kaolin sold or used by domestic producers for specified uses, 1935–50.

BALL CLAY

Sales of ball clay in 1950 broke all previous records both in tonnage and value. The increase over 1949 was 30 percent both in tonnage and value; there was a 9-percent increase in volume over 1948, the previous high. Tennessee, with 57 percent of total sales, was first in

[2] Georgia Mineral Society, vol. 3, No. 4, July–August 1950, p. 112.
[3] Chemical and Engineering News, Kaolin Clay Production Methods Adopted to Specify End Use: Vol. 28, No. 19, May 8, 1950, pp. 1580–1581.
[4] Shabaker, Hubert A. (assigned to Houdry Process Corp.), U. S. Patent 2,489,332, Nov. 29, 1949 (Apr. 30, 1946), Am. Ceram. Soc. Jour., vol. 33, No. 6, June 1, 1950, p. 133, and U. S. Patent 2,494,586, Jan. 17, 1950 (Apr. 30, 1946), Am. Ceram. Soc. Jour., vol. 33, No. 7, July 1950, p. 153.

output for the eighth consecutive year, and Kentucky was second with 33 percent. The remainder was produced in Maryland, Mississippi, and New Jersey. Kentucky's and Tennessee's output increased 18 and 39 percent, respectively, compared with 1949; the other producing States also reported increases.

TABLE 5.—Ball clay sold by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Kentucky	103,426	$1,155,530	89,281	$1,076,531	105,690	$1,325,161
Maryland, Mississippi, and New Jersey	21,756	284,588	27,265	327,427	34,290	424,480
Tennessee	173,797	1,902,529	132,337	1,660,481	184,434	2,230,526
Total	298,979	3,342,647	248,883	3,064,439	324,414	3,980,167

Almost 79 percent of all ball clay sold in 1950 was consumed by the pottery industry. Ball clay used in making whiteware in 1950 increased 28 percent over 1949; and the amount sold for use in high-grade tile, architectural terra cotta, and enameling increased (40 percent for high-grade tile) over 1949. High-grade tile comprised 12 percent of the national output in 1950, whereas 5 percent went to refractories and the remaining 4 percent was used for enamel, paper filler, and miscellaneous uses.

Price quotations appearing in E&MJ Metal and Mineral Markets in 1950 did not change from those given for 1949 and were as follows: Tennessee—crude ball clay, $10 per short ton, and air-floated and pulverized, $19.50 per ton; Maryland—shredded, in bulk, $7 to $9, and air-floated, in bags, $14 to $17.50 per ton. No quotations on Kentucky ball clay in 1950 were given in E&MJ Metal Mineral Markets. In 1950 the average value per ton for ball clay as reported by producers to the Bureau of Mines was $12.27 compared with $12.31 for 1949 and $11.18 in 1948.

Imports of common blue and ball clay and Gross Almerode clays in 1950 increased 45 percent in volume and 15 percent in value compared with 1949. Unmanufactured blue and ball clays represented the major share of imports; United Kingdom supplied 82 percent of this classification and virtually all the imports of manufactured blue and ball clay. Small tonnages of imports of blue and ball clays came from Canada and Germany. Imports of Gross Almerode clays (from Germany) in 1950 totaled only 34 short tons. Exports, if any, are not separately shown in official foreign trade returns.

A beneficiation technique for lignite-bearing ball clays was described.[5]

FIRE CLAY

Fire clay sold or used in 1950 was the second largest in the history of the industry. It exceeded the previous peak year (1948) by 3 percent and the total tonnage for 1949 by 11 percent. Expansion of the

[5] Phelps, G. W., Beneficiation of Lignite-Bearing Ball Clays: Am. Ceram. Soc. Bull., vol. 29, No. 8, August 1950, pp. 293–295.

national economy in general and increased activity in the refractory and construction industries in particular were for the most part the governing factors effecting increased fire clay output in 1950.

The principal consumers of fire clay in 1950 were refractories 5,148,904 tons (7-percent increase over 1949) and heavy clay products 4,020,357 tons (17-percent increase over 1949). Refractories and heavy clay products combined represented 96 percent of the total tonnage output in 1950—the same proportion as in 1949. About 2 percent was consumed in the manufacture of high-grade tile, 1 percent in chemicals, and the remainder in a wide variety of uses. The chief use of fire clay is in making fire brick and block; this took 3,888,481 tons in 1950, a 3.6-percent increase over 1949. Several less-important uses, including stoneware, rubber, clay crucibles, and glass refractories, each consumed a little less fire clay in 1950 than in 1949.

TABLE 6.—Fire clay, including stoneware clay, sold or used by producers in the United States, 1949–50, by states [1]

State	Sold by producer		Used by producer		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Alabama	96,934	$194,737	25,118	$51,375	122,052	$246,112
Arkansas	(2)	(2)	(2)	(2)	276,245	897,917
California	129,836	386,067	232,656	402,607	362,492	788,674
Colorado	116,594	253,572	58,387	167,772	174,981	421,344
Illinois	168,388	638,610	187,575	445,155	355,963	1,083,765
Indiana	257,930	371,011	121,747	285,818	379,677	656,829
Kentucky	67,151	357,627	306,486	1,369,429	373,637	1,727,056
Maryland	10,838	56,884	142,251	435,093	153,089	491,977
Missouri [3]	360,759	858,775	840,389	2,881,167	1,201,148	3,739,942
New Jersey	64,318	556,735	173,121	439,378	237,439	996,113
Ohio	628,320	1,691,381	1,877,986	4,480,032	2,506,306	6,171,413
Pennsylvania	267,467	874,790	1,396,097	5,441,406	1,663,564	6,316,196
Tennessee	(2)	(2)	(2)	(2)	41,732	205,770
Texas	3,062	12,289	240,311	524,855	243,373	537,144
Utah	7,600	23,900	24,385	67,599	31,985	91,499
Washington	12,449	15,360	72,867	152,264	85,316	167,624
West Virginia	(2)	(2)	(2)	(2)	239,373	586,237
Other States [4]	66,217	287,002	614,605	1,635,813	123,472	232,891
Total	2,257,863	6,578,740	6,313,981	18,779,763	8,571,844	25,358,503
1950						
Alabama	116,714	211,180	51,065	84,584	167,779	295,764
Arkansas	(2)	(2)	(2)	(2)	256,042	789,876
California	206,567	527,476	198,612	473,362	405,179	1,000,838
Colorado	155,707	314,407	64,690	211,933	220,397	526,340
Illinois	220,040	980,250	213,383	451,122	433,423	1,431,372
Indiana	372,259	526,776	131,402	274,342	503,661	801,118
Kentucky	73,459	399,126	349,439	1,690,968	422,898	2,090,094
Maryland	10,743	60,317	156,702	560,005	167,445	620,322
Missouri [3]	377,598	1,071,298	843,578	2,960,049	1,221,176	4,031,347
New Jersey	66,370	595,483	244,772	396,404	311,142	991,887
Ohio	793,697	2,177,968	1,969,109	4,946,634	2,762,806	7,124,602
Pennsylvania	265,288	1,010,591	1,466,567	6,138,998	1,731,855	7,149,589
Tennessee	(2)	(2)	(2)	(2)	20,574	182,692
Texas	3,778	27,148	303,248	647,622	307,026	674,770
Utah	11,913	42,246	24,246	68,846	36,159	111,092
Washington	15,030	19,108	52,996	115,026	68,026	134,134
West Virginia	(2)	(2)	(2)	(2)	309,100	735,285
Other States [4]	83,758	358,893	693,137	1,677,210	191,179	328,250
Total	2,772,921	8,322,267	6,762,946	20,697,105	9,535,867	29,019,372

[1] Includes stoneware clay as follows: 1949—103,417 tons, $224,113; 1950—105,147 tons, $235,063.
[2] Included with "Other States."
[3] Includes diaspore and burley clay as follows: 1949—diaspore, 35,359 tons, $398,885; burley, 32,432 tons, $204,850; 1950—diaspore, 40,750 tons, $488,464; burley, 53,571 tons, $334,299.
[4] Includes States indicated by footnote 2 above and Delaware, Idaho, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Carolina, and Virginia (1949 only).

In 1950 Ohio ranked first in output of fire clay, followed by Pennsylvania, Missouri, Indiana, Illinois, Kentucky, and California. These seven States supplied 78 percent of the total. The remainder was produced in 25 States in 1950 (26 in 1949; Virginia did not report in 1950). Of the 17 principal producing States shown in table 6, Arkansas and Washington reported decreases, and the 15 others reported increases. Price quotations on fire clay do not appear in trade journals. However, the average realization per ton reported to the Bureau of Mines by producers indicated that the average value of fire clay sold in 1950 was $3 compared with $2.91 in 1949. The average value of all fire clay, including both sales and captive tonnage, was $3.04 in 1950 compared with $2.96 in 1949. Quotations on brick manufactured from fire clay were reported in December 1950 in E&MJ Metal and Mineral Markets (1949 price in parentheses) are as follows: Missouri, Kentucky, and Pennsylvania, first quality, $116.60 per thousand ($100), and second quality, $99.60 per thousand ($80); Ohio firebrick, intermediate grade, $83 per thousand ($74), and second grade, $79.20 per thousand ($66).

Imports of fire clay are not shown separately in foreign trade statistics. Exports of fire clay in 1950 were 7 percent in tonnage and 8 percent in value less than in 1949 and totaled 74,693 short tons valued at $704,016. Canada took 85 percent of the total exports, Mexico 9 percent, and Chile 2 percent. The remainder (4 percent) comprised small tonnages to 39 destinations in Central and South America, Europe, Asia, and Africa.

The Harbison-Walker Refractories Co. has selected Windham, Ohio, as the location for a new firebrick plant to produce at the rate of about 20 million brick annually.[6]

BENTONITE

The bentonite producers enjoyed their best year in the history of the industry, with a 6-percent tonnage increase over the previous high year of 1948. Output in 1950 increased 12 percent in tonnage and 23 percent in value over 1949. The general upswing in national production, particularly the increased activity in oil-well drilling and the over-all expansion in the foundry industry, were directly responsible for this large bentonite tonnage. Sales to foundries in 1950 increased 41 percent and to the rotary-drilling industry 14 percent over 1949.

The foundry and petroleum industries consumed 93 percent of the total tonnage; rotary-drilling mud represented 37 percent (357,315 tons), filtering and decolorizing oils 30 percent (297,145 tons), and foundry-sand bond 26 percent (251,716 tons). A wide variety of uses consumed the remaining tonnage (67,675 tons). Bentonite used for filtering and decolorizing oils decreased 2 percent over 1949 and insecticides increased 5 percent. Nine States reported bentonite production in 1950, the same as in 1949. Increases in tonnage were noted for California, Mississippi, South Dakota and Wyoming and decreases for Texas, Arizona, Utah, and Idaho. Colorado reported a small tonnage in 1950 but did not report production in 1949.

[6] Pit and Quarry, vol. 43, No. 3, September 1950, p. 62.

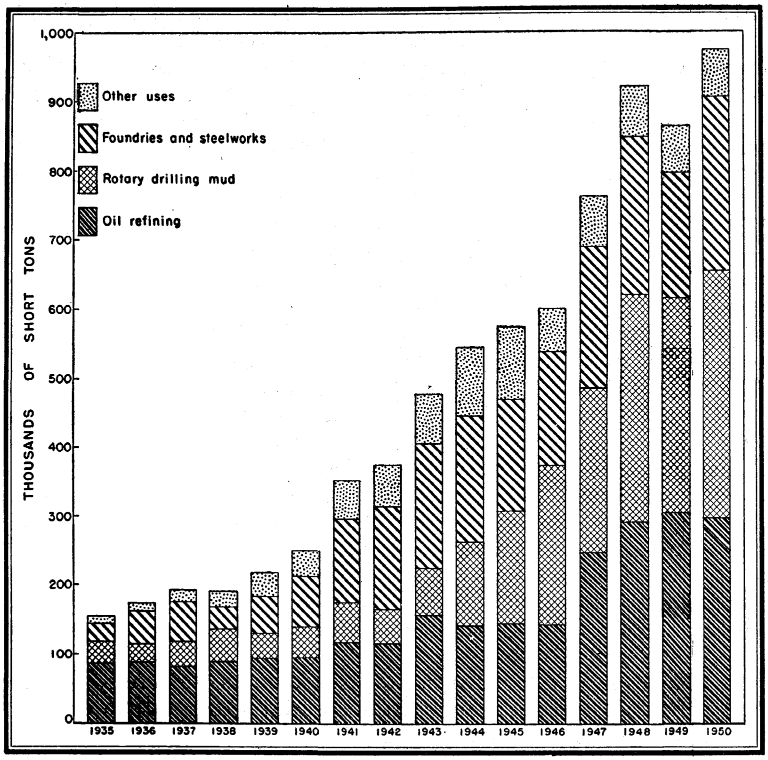

FIGURE 2.—Bentonite sold or used by domestic producers for specified uses, 1935–50.

TABLE 7.—Bentonite sold or used by producers in the United States, 1948–50 by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
California	18,676	$101,450	(1)	(1)	(1)	(1)
South Dakota	156,701	1,702,430	137,376	$1,515,927	192,591	$2,194,894
Texas	29,926	282,036	27,598	302,384	24,574	321,345
Wyoming	383,815	3,682,734	350,644	3,556,480	394,939	4,091,571
Other States [2]	332,442	1,367,658	351,625	1,563,961	361,729	1,952,859
Total	921,560	7,136,308	867,243	6,938,752	973,833	8,560,669

[1] Included with "Other States."
[2] Arizona, California (1949–50 only), Colorado (1948–50 only), Idaho (1949–50 only), Mississippi, Montana (1948–49 only), Nevada (1948 only), and Utah.

The Wyoming-South Dakota district produced 60 percent of the total bentonite in 1950 (Wyoming 40 percent and South Dakota 20 percent) compared with 56 percent in 1949. Texas furnished 3 percent of the total sales —the same as in 1949 and 1948—and the remainder came from California, Mississippi, Arizona, Colorado, Utah and Idaho. Trends in sales for principal uses are shown in figure 2.

In December 1950 Wyoming bentonite was quoted in E&MJ Metal and Mineral Markets as follows: Dried, crushed, in bulk, $9 per ton ($8 in July 1950); and 200-mesh, pulverized, in 100-pound bags $12.50 ($11 in July 1950). Oil-well grade was quoted at $14 per ton. The average value per ton as reported by the producers to the Bureau of Mines in 1950 increased to $8.79 per ton compared with $8 per ton in 1949 and $7.74 in 1948.

Less than 100 tons of bentonite was imported in 1950, entirely from Canada. Exports of bentonite are not shown separately in foreign trade statistics but are included under the blanket classification of "Other clays or earths, not specifically provided for." It is understood, however, that some domestic producers export part of their production to destinations throughout the world.

FULLER'S EARTH

The production of fuller's earth in 1950 reached the highest peak in the history of the industry, increasing 23 percent over 1949 and 18 percent over the previous record year (1930).

The use pattern in 1930 was much different from that in 1950. Mineral-oil refining consumed most of the tonnage in 1930. In 1950 it was still the largest single consumer; but new uses, such as absorbents, insecticides, and rotary-drilling mud, now form 60 percent of the 1950 total.

Fuller's earth consumed in mineral-oil refining in 1950 totaled 156,643 tons or 40 percent of the total output compared with 47 percent in 1949.

From 1946 to the present the increase in total production of fuller's earth has not been reflected in the quantity consumed in refining mineral oil, which has shown a downward trend. It is the consensus that this trend is due in part to improved methods of oil refining and the marketing of a higher quality of fuller's earth.

Absorbent uses took 83,684 tons (21 percent of the total compared with 22 percent in 1949); insecticides, 69,929 tons (18 percent compared with 12 percent for 1949); rotary-drilling mud, 37,631 tons (10 percent compared with 9 percent in 1949); and vegetable-oil and animal fats, 21,261 tons (5 percent compared with 6 percent in 1949). The remainder was used in other filtering and clarifying, binders, and other unspecified uses.

Illinois was the only State reporting production in 1949 that did not produce in 1950, while all other States increased over 1949 in 1950. Florida and Georgia combined accounted for 62 percent and Texas 28 percent of the total tonnage.

As reported by E&MJ Metal and Mineral Markets for December 1950, quotations on Georgia and Florida fuller's earth in 1950 remained unchanged from those of 1949. Prices were as follows: 30- to 60-mesh, $14.50 per short ton; 14- to 30-mesh, $14.00; 200-mesh up, $10.00; and 100-mesh up, $7.00. The average value of fuller's earth sold or used, as reported to the Bureau of Mines by producers, was $16.43 in 1950 compared with $16.20 in 1949 and $15.42 in 1948.

TABLE 8.—Fuller's earth sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Florida and Georgia	188,014	$3,224,169	181,993	$3,194,551	247,390	$4,273,890
Illinois	37,942	410,678	9,104	118,647		
Texas	92,310	1,162,336	100,745	1,242,558	112,466	1,393,773
Other States [1]	23,815	476,668	29,064	643,886	36,169	837,070
Total	342,081	5,273,851	320,906	5,199,642	396,025	6,504,733

[1] Includes California, Mississippi, Nevada, Tennessee, and Utah.

Imports of fuller's earth in 1950 totaled only 237 short tons, all from the United Kingdom. Exports are not given separately in official foreign statistics. Reports from the producers to the Bureau of Mines, however, indicated exports of approximately 16,400 short tons in 1950 compared with 12,100 tons in 1949. Destinations reported include Canada, Central and South America, Netherlands, West Indies, several European nations, Bahrein Island, Saudi Arabia, and the Philippines.

A method for determining the heat of wetting of absorbents is described, and heat-of-wetting data of a series of organic liquids and water are given for activated bauxite and Attapulgus clay (fuller's earth).[7]

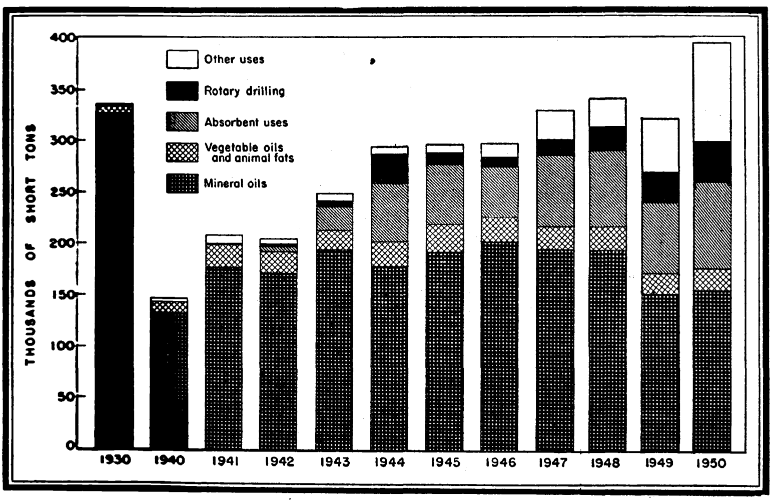

FIGURE 3.—Fuller's earth sold or used by producers for specified uses, 1930 and 1940–50.

MISCELLANEOUS CLAYS

This section includes statistics for the large-tonnage clays and shales, other than those discussed in the preceding pages, that are used in the manufacture of heavy clay products and portland cement. With these clays are grouped small tonnages of slip clay, oil-well

[7] Miller, John G., Heinemann, Heinz, and McCarter, W. S. W., Heat of Wetting of Activated Bauxite and Attapulgus Clay: Ind. Eng. Chem., vol. 42, No. 1, January 1950, pp. 151–153.

drilling mud, pottery clay, and other clays that cannot be clearly identified with one of the types discussed separately in this chapter.

Owing to the continued demand for clay products in the construction field, production of miscellaneous clays, increased 11 percent in tonnage over 1949. In 1950, 71 percent of the total miscellaneous clays were used in manufacturing heavy clay products and 27 percent in cement. Tonnage consumed in heavy clay products was 13 percent more than in 1949, and quantities used in cement manufacture rose 6 percent. Captive tonnage or clay produced by the mine operators for their own use in manufacturing brick, tile, cement, and other end products and marketed for the first time as such, amounted to 96 percent of all miscellaneous clays and shales (figures for which are given in this section). Cement represented 27 percent of the tonnage and heavy clay products 71 percent. The average value of the miscellaneous clays sold as crude or prepared clay in 1950 was $1.49. Some special types of clay included under the "miscellaneous" clay classification, however, sold for much higher amounts. The value of the captive tonnage was computed from individual estimates that generally are $1 or less per ton.

TABLE 9.—Miscellaneous clays, including shale and slip clay, sold or used by producers in the United States, 1949–50, by States

State	Sold by producers [1]		Used by producers [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Alabama	(3)	(3)	(3)	(3)	1, 048, 599	$760, 845
Arkansas			175, 758	$182, 687	175, 758	182, 687
California	216, 802	$664, 659	1, 627, 940	1, 213, 000	1, 844, 742	1, 877, 659
Colorado			294, 347	238, 950	294, 347	238, 950
Connecticut			289, 090	216, 829	289, 090	216, 829
Georgia	(3)	(3)	(3)	(3)	929, 138	753, 761
Illinois	(3)	(3)	(3)	(3)	1, 826, 851	1, 669, 650
Indiana	112, 388	84, 353	803, 674	660, 612	916, 062	744, 965
Iowa	5, 099	80, 677	813, 293	662, 357	818, 392	743, 034
Kansas	(3)	(3)	(3)	(3)	600, 216	455, 181
Kentucky			161, 463	125, 551	161, 463	125, 551
Louisiana	(3)	(3)	(3)	(3)	249, 912	193, 501
Maine			27, 918	24, 568	27, 918	24, 568
Maryland	(3)	(3)	(3)	(3)	489, 009	367, 211
Massachusetts	(3)	(3)	(3)	(3)	150, 530	117, 570
Michigan	(3)	(3)	(3)	(3)	1, 358, 622	1, 007, 740
Minnesota	(3)	(3)	(3)	(3)	113, 960	97, 250
Mississippi	(3)	(3)	(3)	(3)	281, 763	252, 382
Missouri	(3)	(3)	(3)	(3)	618, 914	473, 643
Montana			40, 114	40, 514	40, 114	40, 514
Nebraska			132, 439	112, 699	132, 439	112, 699
New Hampshire			26, 392	19, 795	26, 392	19, 795
New Jersey			295, 800	270, 813	295, 800	270, 813
New Mexico	(3)	(3)	(3)	(3)	93, 412	58, 957
New York	(3)	(3)	(3)	(3)	1, 285, 027	974, 208
North Carolina	(3)	(3)	(3)	(3)	1, 161, 649	964, 749
Ohio	94, 182	73, 865	1, 909, 643	1, 452, 214	2, 003, 825	1, 526, 079
Oklahoma	(3)	(3)	(3)	(3)	480, 199	374, 179
Oregon			159, 068	122, 877	159, 068	122, 877
Pennsylvania	65, 354	106, 646	1, 529, 375	1, 202, 261	1, 594, 729	1, 308, 907
South Carolina	(3)	(3)	(3)	(3)	423, 902	318, 601
Tennessee	(3)	(3)	(3)	(3)	716, 230	507, 121
Texas	36, 587	202, 628	1, 321, 873	995, 435	1, 358, 460	1, 198, 063
Utah			204, 896	428, 071	204, 896	428, 071
Washington	(3)	(3)	(3)	(3)	193, 021	134, 442
West Virginia			315, 151	230, 594	315, 151	230, 594
Wisconsin	(3)	(3)	(3)	(3)	159, 360	116, 215
Wyoming			19, 138	10, 564	19, 138	10, 564
Undistributed [4]	498, 592	493, 284	12, 549, 189	9, 706, 065	867, 467	602, 143
Total	1, 029, 004	1, 706, 112	22, 696, 561	17, 916, 456	23, 725, 565	19, 622, 568

For footnotes, see end of table.

TABLE 9.—Miscellaneous clays, including shale and slip clay, sold or used by producers in the United States, 1949–50, by States—Continued

State	Sold by producers [1]		Used by producers [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1950						
Alabama	(3)	(3)	(3)	(3)	1,170,153	$900,329
Arkansas			219,117	$217,127	219,117	217,127
California	124,389	$468,616	1,722,993	1,454,109	1,847,382	1,922,725
Colorado	(3)	(3)	(3)	(3)	281,238	231,740
Connecticut			292,367	236,317	292,367	236,317
Georgia			1,024,095	804,190	1,024,095	804,190
Illinois	(3)	(3)	(3)	(3)	2,086,008	1,966,336
Indiana	93,775	89,981	815,297	714,320	909,072	804,301
Iowa	4,890	79,330	834,514	749,512	839,404	828,842
Kansas			706,615	563,670	706,615	563,670
Kentucky			189,624	180,710	189,624	180,710
Louisiana	(3)	(3)	(3)	(3)	327,067	273,116
Maine			31,917	26,561	31,917	26,561
Maryland	(3)	(3)	(3)	(3)	558,888	435,493
Massachusetts			148,420	115,318	148,420	115,318
Michigan	(3)	(3)	(3)	(3)	1,425,493	1,135,740
Minnesota	(3)	(3)	(3)	(3)	110,962	97,385
Mississippi	(3)	(3)	(3)	(3)	268,690	247,467
Missouri	(3)	(3)	(3)	(3)	725,551	624,921
Montana			33,817	33,817	33,817	33,817
Nebraska	(3)	(3)	(3)	(3)	152,880	148,017
New Hampshire	(3)	(3)	(3)	(3)	22,719	17,115
New Jersey			286,885	234,943	286,885	234,943
New Mexico	(3)	(3)	(3)	(3)	44,364	43,994
New York	(3)	(3)	(3)	(3)	1,443,129	1,155,656
North Carolina			1,413,314	1,269,381	1,413,314	1,269,381
Ohio	86,387	94,851	2,127,937	1,835,769	2,214,324	1,930,620
Oklahoma	(3)	(3)	(3)	(3)	555,910	493,659
Oregon			159,049	123,163	159,049	123,163
Pennsylvania	25,934	60,784	1,661,779	1,354,562	1,687,713	1,415,346
South Carolina			638,852	508,223	638,852	508,223
Tennessee	(3)	(3)	(3)	(3)	877,659	634,652
Texas	16,395	297,126	1,578,816	1,328,377	1,595,211	1,625,503
Utah			234,450	543,552	234,450	543,552
Washington	(3)	(3)	(3)	(3)	215,433	167,647
West Virginia			366,001	269,135	366,001	269,135
Wisconsin	(3)	(3)	(3)	(3)	162,611	132,056
Wyoming			18,332	10,551	18,332	10,551
Undistributed [4]	474,307	466,047	11,070,181	9,111,168	1,115,733	871,892
Total	826,077	1,556,735	25,574,372	21,684,475	26,400,449	23,241,210

[1] Includes slip clay as follows: 1949–50—Indiana, Michigan, and New York; figures cannot be shown separately. Purchases by portland-cement companies of common clay and shale: 1949—559,682 tons, estimated at $494,147; 1950—555,910 tons, estimated at $466,600.

[2] Includes the following: Common clay and shale used by portland-cement companies: 1949—6,058,502 tons, estimated at $3,866,210; 1950—6,453,777 tons, estimated at $4,840,342.

[3] Included under "Undistributed."

[4] Figures include Arizona, Delaware, District of Columbia, Florida, Idaho, Nevada, North Dakota, South Dakota, Vermont, Virginia, and States indicated by footnote 3.

Miscellaneous clays, including shales and the so-called common or surface clays, are of widespread occurrence, and workable commercial deposits are reported in all States except Rhode Island. Two States—Illinois and Ohio—reported tonnages exceeding 2 million short tons each. Other States reporting a production of over 1 million tons were, in order of output: California, Pennsylvania, Texas, New York, Michigan, North Carolina, Alabama and Georgia. Of the States for which data are shown in table 9, 27 reported increases in output, and 11 reported decreases in 1950 compared with 1949.

HEAVY CLAY PRODUCTS

With construction expanding at an accelerated pace, especially industrial construction, shipments of structural clay products continued to increase; all principal classifications substantially reflected this surge upward except drain tile, which fell short of 1949 shipments by 9 percent; all others increased over 1949 as follows; unglazed brick (common and face) 24 percent; unglazed structural tile 5 percent; vitrified clay sewer pipe, 16 percent; hollow facing tile, glazed and unglazed, 21 percent; and glazed and unglazed floor and wall tile 37 percent.

TABLE 10.—Shipments of principal structural clay products in the United States, 1948–50 [1]

Product and unit of quantity	1948		1949		1950	
	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)	Quantity	Value (thousand dollars)
Unglazed brick (common and face) M stand. brick	5,706,838	134,445	5,251,633	129,179	6,486,332	164,470
Unglazed structural tile short tons	1,250,904	13,364	1,259,445	14,060	1,316,972	14,896
Vitrified clay sewer pipe do	1,432,512	46,731	1,349,598	44,641	1,567,664	53,402
Drain tile do	734,331	10,866	688,010	11,084	627,545	10,191
Hollow facing tile, glazed and unglazed M brick equiv	321,841	16,029	357,461	18,717	432,027	22,438
Glazed and unglazed floor and wall tile and accessories, including quarry tile M square feet	102,251	46,646	93,115	43,905	127,302	61,579

[1] Compiled from information furnished by the Bureau of the Census, U. S. Department of Commerce.

The total value of the principal structural clay products in 1950 increased 25 percent to $327,000,000 from $262,000,000 in 1949.

The value of shipments of all branches of the clay-refractories industry shown in table 11 increased in 1950 compared with 1949. Over-all expansion in the steel and foundry industries (due for the most part to the present national emergency) augmented the demand for clay refractories. The value of shipments of firebrick (except superduty) was 57,489,000, 18 percent over 1949; of superduty fire-clay brick, 32 percent over 1949; and of ladle brick, 41 percent compared to 1949.

TABLE 11.—Production and shipments of refractories in the United States, by kind, 1949–50

[Bureau of the Census]

Product	Unit of quantity	1949			1950		
		Production (quantity)	Shipments		Production (quantity)	Shipments	
			Quantity	Value (thousands of dollars)		Quantity	Value (thousands of dollars)
Clay refractories:							
Fire-clay brick, standard and special shapes, except superduty	1,000 9-in. equiv.	523,623	514,378	48,819	560,492	565,103	57,489
Superduty fire-clay brick, standard and special shapes.	do	57,353	51,586	7,680	63,105	64,046	10,108
High-alumina brick, standard and special shapes (50 percent Al_2O_3 and over, except fused alumina and mullite).	do	16,459	16,346	4,392	17,620	17,670	4,757
Insulating firebrick, standard and special shapes.	do	29,239	33,315	5,840	40,986	43,204	7,635
Ladle brick	do	164,089	159,790	8,557	196,869	198,230	12,075
Hot-top refractories	do	34,560	34,284	3,261	41,847	42,640	4,489
Sleeves, nozzles, runner brick and tuyères.	do	40,310	39,189	4,802	53,076	53,106	6,895
Glass-house pots, tank blocks, upper structure, and floaters.	Short tons	17,218	17,564	2,539	19,919	21,294	3,177
High-temperature bonding mortars	do	54,462	53,829	4,146	65,146	65,517	5,494
Plastic refractories (including wet and dry ramming mixtures).	do	79,386	77,080	3,701	90,687	91,455	4,511
Cast and castables (hydraulic setting).	do	47,437	47,675	3,430	57,743	57,300	4,396
Ground crude fire clay and high-alumina material.	do	329,470	327,864	2,943	380,385	381,163	3,611
Other clay refractories				2,034			2,049
Total clay refractories				102,144			126,686
Nonclay refractories:							
Silica brick, standard and special shapes.	1,000 9-in equiv.	266,596	261,719	30,320	312,334	309,353	38,222
Magnesite and magnesite-chrome (magnesite predominating) brick, standard and special shapes.	do	18,508	18,650	9,279	28,135	27,779	14,415
Chrome and chrome-magnesite (chrome predominating) brick, standard and special shapes.	do	35,847	34,777	14,312	46,528	45,489	19,672
Graphite and other carbon crucibles and retorts.	Short tons	7,180	7,328	3,628	10,116	10,329	5,690
Other graphite and carbon refractories.	do	846	814	298	1,269	1,206	503
Silicon carbide				6,116			7,957
Mullite and kyanite				2,454			3,509
Sillimanite				256			238
Fused alumina and bauxite				2,530			2,255
Zirconia, forsterite, fused magnesia, pyrophyllite, and other nonclay shapes.				1,693			3,995
High-temperature bonding mortars	Short tons	30,954	30,820	3,332	38,101	38,175	4,345
Plastic refractories (including wet and dry ramming mixtures).	do	72,339	72,015	4,934	98,721	98,858	7,175
Other nonclay refractory materials, sold in lump or ground form (including ground silica and nonclay cast and castables).				2,875			3,995
Total nonclay refractories [1]				82,027			111,971
Grand total refractories [1]				184,171			238,657

[1] Data for dead-burned magnesia or magnesite excluded to avoid duplication in other refractory products covered in this table (such as magnesite brick and shapes). Quantity and value of shipments of dead-burned magnesia or magnesite totaled 218,000 tons valued at $8,606,000 in 1949 and 283,000 tons valued at $11,901,000 in 1950.

The refractory material best-suited to each of the many complex applications was discussed.[8]

A wave of plant modernization and expansion swept over the structural clay products field to help stimulate the use of clays and shales.[9]

Research and development in the use and application of clays were discussed.[10]

The Kansas Geological Survey was about to start a study on the commercial uses of Kansas clays.[11]

The utilization of Wilcox-group clays in Arkansas was described.[12]

A clay-improvement process, designed to cut costs and improve quality, was announced by the University of Wisconsin.[13]

A survey was being made to check all known clay pits in Indiana, under the direction of Prof. John B. Patton, State geologist. Samples were to be analyzed and cataloged as to location and types.[14]

TECHNOLOGY

The Structural Clay Products Research Foundation, organized in 1949 to carry forward a $1,250,000 5-year investigation into all phases of the brick and tile industry, has taken definite form. A contract has been given to the Armour Research Foundation of the Illinois Institute of Technology in Chicago as the first step in this 5-year plan.[15] The Brick and Tile Research Institute, also organized in 1949 to further the interests of clay products manufactured in the Southeast, reports progress in product research.[16]

The interest in and production of lightweight aggregates from common clays and shales increased, and improved methods and new developments were discussed.[17]

Increased consideration is being given to the use of clays, including halloysite and bentonite, as catalytic agents in the oil-refining industry.[18] The Filtrol Corporation was constructing a $2,500,000 plant at Salt Lake City, Utah, to use halloysite for this purpose and expected it to be in operation early in 1951.[19]

[8] Steel, Refractory Materials, Their Peculiarities, Virtues, and Faults: Vol. 126, No. 10, Mar. 6, 1950, pp. 86, 90, 110, 112, 114, 117.
[9] Brick and Clay Record, vol. 116, No. 4, pp. 43, 56–58, 96.
[10] American Ceramic Society Bulletin, Ceramics at Batelle Memorial Institute: Vol. 29, No. 7, July 1950, pp. 262–265; No. 8, August 1950, pp. 300–302.
[11] Ceramic Industry, vol. 54, No. 1, January 1950, p. 43.
[12] Funnell, John E., Studies of Wilcox Clays in Arkansas: Am. Ceram. Soc. Bull., vol. 29, No. 8, August 1950, pp. 286–289.
[13] American Ceramic Society Bulletin, Control of Plastic Clay: Vol. 29, No. 8, August 1950, pp. 291–292.
[14] Brick and Clay Record, vol. 117, No. 3, September 1950, p. 39.
[15] Brick and Clay Record, vol. 117, No. 1, July 1950, p. 39, and No. 2, August 1950, p. 33; vol. 117, No. 5, November 1950, pp. 27–52.
[16] Brick and Clay Record, vol. 117, No. 5, November 1950, pp. 22–23.
[17] Brick and Clay Record 1950, vol. 116, No. 2, February 1950, pp. 40–42, 44–45, 48; No. 3, March 1950, pp. 41–42, 76; No. 4, April 1950, pp. 64–66, 69; No. 5, May 1950, pp. 52–55; No. 6, June 1950, pp. 49, 84, 86. Vol. 117, No. 1, July 1950, p. 56; No. 2, August 1950, pp. 44–45, 66, 68; No. 3, September 1950, p. 51; No. 4, October 1950, pp. 51–68; No. 5, November 1950, pp. 44–46.
Mining Engineer, vol. 187, No. 4, April 1950, p. 479.
American Ceramic Society Bulletin, vol. 29, No. 11, November 1950, pp. 421–422.
[18] Mills, G. A., Aging of Cracking Catalysts: Ind. Eng. Chem., vol. 42, No. 1, January 1950, pp. 182–187.
Mills, G. A. Cornellius, E. B., Conversion of Hydrocarbons with Motified Clay Calalysts: Am. Ceram. Soc. Jour., vol. 33, No. 7, July 1950, pp. 152–153.
[19] Engineering and Mining Journal, vol. 151, No 8, August 1950, pp. 148–149.

A number of articles have been published covering plant modernization in the structural clay products and pottery industries.[20]

Oil and natural gas are being used more extensively in the ceramic industry.[21] The behavior of clays during the several stages of drying was discussed.[22]

The Engineering College Research Council of America Society for Education has published its 1949 survey on engineering research. Physical and chemical properties of clays and shales in United States and their commercial potentialities are included in this report.[23]

An international committee for the study of clays was formed in London in 1949. The aim was to group specialists in the study of clays from all angles in different countries. R. E. Grim of the University of Illinois is the United States member of the executive subcommittee.[24]

The Department of Mines and Technical Surveys, Mineral Resources Division, Ottawa, Canada, published a survey of the manufacturers of clay products in Canada.[25]

The classification of industrial clays used in individual plants, their source, quantity, and type of products produced are given.

The Mineral Development Committee of Great Britain recently has issued a report giving estimates of deposits of various minerals including china clay.[26] Published data on clays in industrial periodicals were given on the following; Fire-clay resources of Japan, including ball clay[27]; shales, clays and kaolins of France[28]; a study of high-alumina clays found in France[29]; refractory clays in the Union of South Africa[30]; a substantial china-clay deposit was found in Ceylon.[31] The Commonwealth Scientific and Industrial Research Organization of Australia is making a survey of clay deposits suitable for producing heavy clay products. One large plant of United States design for producing brick and tile is now under construction.[32] The thermochemical changes in alundite clays found in Egypt were discussed. These clays are an important source of refractory material.[33]

---

[20] Brick and Clay Record, vol. 116, No. 4, April 1950, pp. 56–59, 96; No. 5, May 1950, pp. 46–49, 68, and pp. 59–62, 68; No. 6, June 1950, pp. 53–55. Vol. 117, No. 1, July 1950, pp. 42–45, 47, 74, 78, 80, and pp. 66–68, 76; No. 2, August 1950, pp. 47–51; No. 3, September 1950, pp. 46–49, 69; No. 6, December 1950, pp. 32–35.
Ceramic Industry, vol. 54, No. 2, February 1950, pp. 62–65, 67, 69, 80–81; No. 4, April 1950, pp. 122–125, 150, pp. 127–128, 174, and pp. 131–132; No. 5, May 1950, pp. 82–83, 85, 104. Vol. 55, No. 1, July 1950, pp. 86–90, 93; No. 2, August 1950, pp. 72, 75–76; No. 3, September 1950, pp. 85, 87–88, 111, and p. 90.

[21] Brick and Clay Record, vol. 116, No. 3, March 1950, pp. 45, 74, 76; No. 4, April 1950, pp. 65–66, 69, and pp. 71, 102; No. 5, May 1950, pp. 43, 74. Vol. 117, No. 5, November 1950, p. 53.

[22] Beckemeyer, H. J., Fundamentals of the Drying Process: Brick and Clay Record, vol. 117, No. 4, October 1950, pp. 47, 49, 76; No. 5, November 1950, pp. 50–52.
Carothers, T. E., Instant Drying Eliminates Filter Pressing: Ceram. Ind., vol. 54, No. 6, June 1950, pp. 101, 102, 120.

[23] Ceramic Age, vol. 55, No. 3, March 1950, p. 162.

[24] Refractories Journal, No. 7, July 1950, p. 292.

[25] Canada Department of Mines and Technical Resources, Mines Branch, Manufacturers of Clay Products in Canada: Mineral Resources Div., Ottawa, No. 6-3, April 1950, 14 pp.

[26] Ceramic Age, vol. 55, No. 1, January 1950, p. 26.

[27] Lee, Donald E., Fire Clay Resources of Japan (Including Ball Clay): Ceram. Age, vol. 56, No. 6, December 1950, pp. 20–21, 24, 65–67.

[28] Larchevêque, I. M., [Shales, Clays, and Kaolins of France]: Ind. Céramique, 1948, No. 385, pp. 75–77; American Ceramic Society Journal, vol. 33, No. 5, May 1950, pp. 104–105 (abs).

[29] Refractories Journal, No. 11, November 1950, p. 456.

[30] American Ceramic Society Bulletin, vol. 29, No. 7, July 1950, p. 257.

[31] Mining World, vol. 12, No. 9, August 1950, p. 63.

[32] Mining Journal, vol. 234, No. 5972, February 1950, p. 119.

[33] Gad, Gamel M., Thermochemical Changes in Alunite and Alunitic Clays: Jour. Am. Ceram. Soc., vol. 33, No. 6, June 1950, pp. 208–210.

Coal—Bituminous and Lignite[1]

By W. H. Young, R. L. Anderson, and E. M. Hall

GENERAL SUMMARY

THE output of soft coal in 1950—estimated at 512,000,000 tons[2]—was 17 percent higher than the 437,868,036 tons produced in 1949. The smaller amount of time lost by strikes in 1950 compared to 1949 largely explains the increase. According to the Bureau of Labor Statistics, 9,320,000 man-days were lost on account of strikes in 1950 compared to 16,700,000 man-days in 1949.

Production.—Production was low during the first 2 months of 1950, largely because of strikes and labor difficulties. During the last 10 months, output averaged close to the 11,000,000-ton-per-week level.

Trend of Employment.—The average number of men working daily at bituminous-coal and lignite mines in 1950 decreased to 431,000 from 433,698 in 1949.

Index to Capacity.—As it is not possible for all mines to operate every working day in the year, a conservative figure of 280 days for calculating potential capacity was suggested some years ago by the coal committee of the American Institute of Mining and Metallurgical Engineers. (*See* Minerals Yearbook, 1935, pp. 631–632.) The average output per day worked in 1950 was 2,994,152 tons, which (if applied to 280 days) gives an annual potential output of 838,000,000 tons compared with the actual production of 512,000,000.

Mechanization.—More coal was loaded mechanically at underground mines in the United States in 1950 than in 1949. Also, the percentage mechanically loaded increased from 67 percent of the total underground output in 1949 to 68 percent in 1950. Sales of underground loading equipment, in terms of capacity, were less in 1950 than in any year since 1935.

Mechanical Cleaning.—The total capacity of mechanical-cleaning equipment sold for use at bituminous-coal mines in 1950 was estimated at 12,200 tons of cleaned coal per hour, an 8-percent decrease from the previous year.

Consumption.—Five classes of consumers used less coal in 1950 than in 1949, while four classes increased their consumption. The total consumption in 1950 was approximately 8,000,000 tons more than in 1949. Table 36 shows trends in consumption for the major classes of consumers.

Trends of Fuel Efficiency.—During 1950 electric public-utility power plants attained increased fuel efficiency.

Competition With Oil and Gas.—Soon after World War II, increased competition developed among the fuels, with numerous reports of conversion from coal to fuel oil and gas.

[1] Data for 1950 are preliminary; final figures will be issued in a Mineral Market Report about November 1951. Data for 1949 are final.

[2] Throughout this chapter, "tons" refers to net tons of 2,000 pounds, except that the world table is in metric tons of about 2,205 pounds.

TABLE 1.—Salient statistics of the bituminous-coal and lignite industry in the United States, 1949–50

[All tonnage figures represent net tons]

	1949	1950 (preliminary)	Change from 1949 (percent)
Production	437,868,036	512,000,000	+16.9
Consumption in the United States	445,538,000	453,830,000	+1.9
Stocks at end of year:			
Industrial consumers and retail yards	45,111,000	72,516,000	+60.8
Stocks on upper Lake docks	3,261,996	6,206,997	+90.3
Imports and exports: [1]			
Imports	314,980	346,653	+10.1
Exports	27,842,056	25,468,403	−8.5
Price indicators (average per net ton):			
Average cost of railroad fuel purchased, f. o. b. mines [2]	$4.36	$4.49	+3.0
Average cost of coking coal at merchant coke ovens	$9.33	$9.27	−.6
Average retail price [3]	$15.83	$16.48	+4.1
Average railroad freight charge per net ton [2]	$3.00	$3.09	+3.0
Average value f. o. b. mines	$4.88	$4.85	−.6
Underground loading machinery sold:			
Mobile loading machines (number)	286	289	+1.0
Scrapers (number)	8	1	−87.5
Conveyors, including those equipped with duckbills (units)	394	316	−19.8
"Mother" conveyors (units)	116	132	+13.8
Surface stripping	106,045,299	122,000,000	+15.0
Mechanically loaded underground	222,375,882	266,000,000	+19.6
Mechanically cleaned	153,651,903	181,000,000	+17.8
Number of mines	8,559	8,400	−1.9
Average number of days worked	157	171	+8.9
Average number of men working daily	433,698	431,000	−.6
Production per man per day	6.43	6.95	+8.1
Fuel-efficiency indicator:			
Pounds of coal per kw.-hr. at electric power plants [4]	1.24	1.19	−4.0

[1] U. S. Department of Commerce.
[2] Interstate Commerce Commission.
[3] Bureau of Labor Statistics, U. S. Department of Labor.
[4] Federal Power Commission.

Electric-power utilities consumed 9 percent more bituminous coal, 14 percent more fuel oil, and 14 percent more gas in 1950 than in 1949.

Class I railroads decreased their consumption of coal 11 percent in 1950 from 1949 and increased their purchases of fuel oil and Diesel oil 8 percent during the same period.

The manufacture of domestic coal-burning equipment is reflected in statistics published by the Bureau of the Census. Factory sales of domestic stokers for burning bituminous coal decreased from 21,756 (revised figure) in 1949 to 13,138 in 1950. Shipments of domestic oil burners, boiler-burner units, and furnace-burner units increased from 569,445 (revised figure) in 1949 to 879,016 in 1950.

Stocks.—The reserve supply of bituminous coal and lignite in the hands of industrial consumers and retail coalyards increased from 45,111,000 tons at the beginning of 1950 to 72,516,000 tons at the close. The days' supply of stocks increased from 32 to 50. Stocks on the upper Lake docks increased 2,945,001 tons from January 1 to December 31, 1950.

SOURCES OF DATA

Bituminous-coal- and lignite-production statistics for 1950 are preliminary estimates based upon (1) weekly or monthly reports of railroad carloadings of coal and beehive coke by all the important carriers, (2) shipments by river as reported by the United States Army Engineers, (3) direct reports from a number of mining companies, and (4) monthly production statements complied by certain local operators' associations and State mine departments. In the estimates for 1950, allowance has been made for commercial truck shipments, local sales and colliery fuel, and small trucking or wagon mines producing 1,000 tons a year or more.

Data for 1949 are final and based upon detailed annual reports of production and mine operation furnished by the producers. As in previous years, all but a small percentage of the output was covered by the reports submitted. For the remaining output not directly reported—consisting chiefly of small mines—it has been possible to obtain reasonably accurate data from the records of the State mine departments, which have statutory authority to require such reports, or, in a few instances, from railroad carloadings.

In accordance with the practice followed by the Bureau of Mines in previous years, the statistics in this report relate to mines having an output of 1,000 tons a year or more and do not attempt to include many small mines producing less than 1,000 tons a year.

As in previous years, these data include all coal produced in Alaska and all that produced in the United States except Pennsylvania anthracite.

RESERVES[3]

TABLE 2.—Coal reserves of the United States, Jan. 1, 1950, by States

[In thousands of short tons]

State	Estimated original reserves					Reserves depleted to Jan. 1, 1950		Remaining reserves, Jan. 1, 1950	Recoverable reserves, Jan. 1, 1950, assuming 50-percent recovery
	Bituminous coal	Subbituminous coal	Lignite	Anthracite and semianthracite	Total	Produced [1]	Produced and lost in mining, assuming past losses equal production		
Alabama	67,570,000				67,570,000	821,590	1,643,180	65,926,820	32,963,410
Arkansas	1,396,000		90,000	230,000	1,716,000	91,894	183,788	1,532,212	766,106
Colorado	213,071,000	104,175,000		100,000	317,346,000	471,146	942,292	316,403,708	158,201,854
Georgia	933,000				933,000	11,533	23,066	909,934	454,967
Illinois	171,905,000				171,905,000	3,131,997	6,263,994	165,641,006	82,820,503
Indiana	53,051,000				53,051,000	984,137	1,968,274	51,082,726	25,541,363
Iowa	29,160,000				29,160,000	343,162	686,324	28,473,676	14,236,838
Kansas	[2] 17,574,000				[2] 17,574,000	[3] 9,800	[3] 19,600	17,554,400	8,777,200
Kentucky	123,327,000				123,327,000	1,951,803	3,903,606	119,423,394	59,711,697
Maryland	8,043,000				8,043,000	259,943	519,886	7,523,114	3,761,557
Michigan	296,900				296,900	[4] 46,240	[5] 77,000	219,900	109,950
Missouri	79,362,016				79,362,016	257,787	515,574	78,846,442	39,423,221
Montana	2,362,610	132,151,060	87,533,270		222,046,940	157,248	314,496	221,732,444	110,866,222
New Mexico	10,947,700	50,801,200		5,700	61,754,600	121,507	243,014	61,511,586	30,755,793
North Carolina	110,462				110,462	1,054	2,108	108,354	54,177
North Dakota			600,000,000		600,000,000	67,856	135,712	599,864,288	299,932,144
Ohio	86,497,000				86,497,000	1,694,259	3,388,518	83,108,482	41,554,241
Oklahoma	54,951,000				54,951,000	158,846	317,692	54,633,308	27,316,654
Pennsylvania	75,093,459			22,805,000	97,898,459	12,332,962	24,665,924	73,232,535	36,616,268
South Dakota			1,020,000		1,020,000	921	1,842	1,018,158	509,079
Tennessee	25,665,000				25,665,000	324,718	649,436	25,015,564	12,507,782
Texas	8,000,000		23,000,000		31,000,000	62,047	124,094	30,875,906	15,437,953
Utah	88,184,000	5,156,000			93,340,000	198,665	397,330	92,942,670	46,471,335
Virginia	21,149,000			500,000	21,649,000	548,479	1,096,958	20,552,042	10,276,021
Washington	11,413,000	52,442,000		23,000	63,878,000	142,904	285,808	63,592,192	31,796,096
West Virginia	116,618,447				116,618,447	4,979,385	9,958,770	106,659,677	53,329,838
Wyoming	13,234,950	[6] 108,318,900	(6)		121,553,850	362,375	724,750	120,829,100	60,414,550
Other States	[7] 820,000	[8] 15,500,000	[9] 49,963		16,369,963	8,789	17,578	16,352,385	8,176,193
Total	1,280,735,544	468,544,160	711,693,233	23,663,700	2,484,636,637	29,543,047	59,070,614	2,425,566,023	1,212,783,012

[1] Production, 1800 through 1885, from Eavenson, H. N., The First Century and a Quarter of American Coal Industry: 1942, 701 pp.; production, 1886 through 1949, from Geological Survey Mineral Resources of the United States and Bureau of Mines Minerals Yearbooks, unless otherwise indicated.

[2] Remaining reserves, Jan. 1, 1946.

[3] Production, Jan. 1, 1946, to Jan. 1, 1950.

[4] Michigan Geological Survey Division, as cited in Geol. Circular 77, 1950, p. 56.

[5] Past losses assumed to be 40 percent of coal originally in the ground.

[6] Small reserves of lignite included under subbituminous coal.

[7] Includes Arizona, California, Idaho, and Oregon.

[8] Includes Arizona, California, and Oregon.

[9] Includes California and Louisiana.

Averitt, Paul, and Berryhill, Louise R., Coal Resources of the United States: Geol. Survey Circ. 94, 1950, p. 5.

DOMESTIC PRODUCTION

The trend of average production of bituminous coal and lignite per working day in 1941–50 is illustrated in figures 1 and 5.

The demand for bituminous coal and lignite compared with petroleum, natural gas, and water power in 1899–1950 is shown in tables 38–40 and figures 8 and 9.

Production statistics for lignite are shown separately from bituminous coal in tables 43–47.

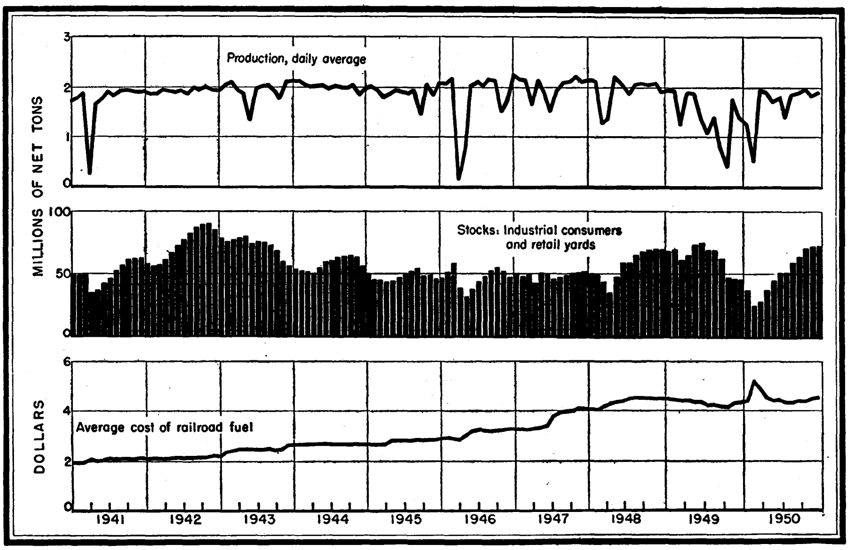

FIGURE 1.—Trends of production, stocks, and prices of bituminous coal and lignite in the United States, 1941–50.

PRODUCTION BY YEARS

Production and capacity of bituminous-coal and lignite mines in 1905–50 are shown graphically in figure 2.

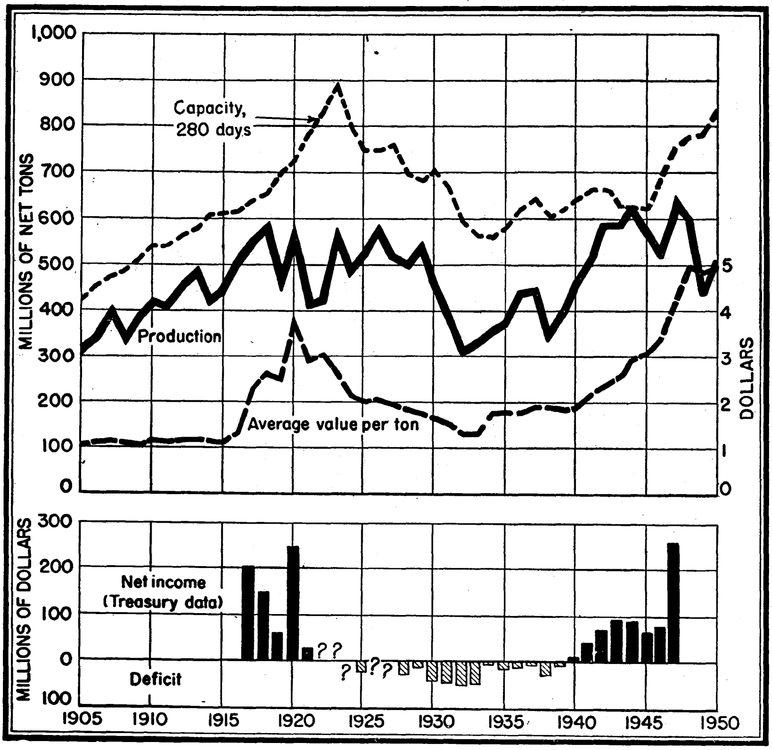

FIGURE 2.—Trends of bituminous-coal and lignite production, realization, mine capacity, and net income or deficit in the United States, 1905–50.

TABLE 3.—Growth of the bituminous-coal and lignite-mining industry in the United States, 1890–1949

Year	Production (net tons)	Value of production [1]		Number of mines	Capacity at 280 days (millions of tons)
		Total	Average per ton		
1890	111,302,322	$110,420,801	$0.99	(2)	137
1891	117,901,238	117,188,400	.99	(2)	148
1892	126,856,567	125,124,381	.99	(2)	162
1893	128,385,231	122,751,618	.96	(2)	174
1894	118,820,405	107,653,501	.91	(2)	196
1895	135,118,193	115,779,771	.86	2,555	196
1896	137,640,276	114,891,515	.83	2,599	202
1897	147,617,519	119,595,224	.81	2,454	213
1898	166,593,623	132,608,713	.80	2,862	221
1899	193,323,187	167,952,104	.87	3,245	230
1900	212,316,112	220,930,313	1.04	(2)	255
1901	225,828,149	236,422,049	1.05	(2)	281
1902	260,216,844	290,858,483	1.12	(2)	316
1903	282,749,348	351,687,933	1.24	(2)	350
1904	278,659,689	305,397,001	1.10	4,650	386
1905	315,062,785	334,658,294	1.06	5,060	417
1906	342,874,867	381,162,115	1.11	4,430	451
1907	394,759,112	451,214,842	1.14	4,550	473
1908	332,573,944	374,135,268	1.12	4,730	482
1909	379,744,257	405,486,777	1.07	5,775	510
1910	417,111,142	469,281,719	1.12	5,818	538
1911	405,907,059	451,375,819	1.11	5,887	538
1912	450,104,982	517,983,445	1.15	5,747	566
1913	478,435,297	565,234,952	1.18	5,776	577
1914	422,703,970	493,309,244	1.17	5,592	608
1915	442,624,426	502,037,688	1.13	5,502	610
1916	502,519,682	665,116,077	1.32	5,726	613
1917	551,790,563	1,249,272,837	2.26	6,939	636
1918	579,385,820	1,491,809,940	2.58	8,319	650
1919	465,860,058	1,160,616,013	2.49	8,994	669
1920	568,666,683	2,129,933,000	3.75	8,921	725
1921	415,921,950	1,199,983,600	2.89	8,038	781
1922	422,268,099	1,274,820,000	3.02	9,299	832
1923	564,564,662	1,514,621,000	2.68	9,331	885
1924	483,686,538	1,062,626,000	2.20	7,586	792
1925	520,052,741	1,060,402,000	2.04	7,144	748
1926	573,366,985	1,183,412,000	2.06	7,177	747
1927	517,763,352	1,029,657,000	1.99	7,011	759
1928	500,744,970	933,774,000	1.86	6,450	691
1929	534,988,593	952,781,000	1.78	6,057	679
1930	467,526,299	795,483,000	1.70	5,891	700
1931	382,089,396	588,895,000	1.54	5,642	669
1932	309,709,872	406,677,000	1.31	5,427	594
1933	333,630,533	445,788,000	1.34	5,555	559
1934	359,368,022	628,383,000	1.75	6,258	565
1935	372,373,122	658,063,000	1.77	6,315	582
1936	439,087,903	770,955,000	1.76	6,875	618
1937	445,531,449	864,042,000	1.94	6,548	646
1938	348,544,764	678,653,000	1.95	5,777	602
1939	394,855,325	728,348,366	1.84	5,820	621
1940	460,771,500	879,327,227	1.91	6,324	639
1941	514,149,245	1,125,362,836	2.19	6,822	666
1942	582,692,937	1,373,990,608	2.36	6,972	663
1943	590,177,069	1,584,644,477	2.69	6,620	626
1944	619,576,240	1,810,900,542	2.92	6,928	624
1945	577,617,327	1,768,204,320	3.06	7,033	620
1946	533,922,068	1,835,539,476	3.44	7,333	699
1947	630,623,722	2,622,634,946	4.16	8,700	755
1948	599,518,229	[3] 2,993,267,021	4.99	9,079	774
1949	437,868,036	2,136,870,571	4.88	8,559	781

[1] Figures for 1890 to 1936 and 1939 exclude selling expense. Figures for 1937–38 and 1940–49 include selling expense.
[2] Data not available.
[3] Revised figure.

PRODUCTION BY MONTHS AND WEEKS

The following tables summarize the statistics of monthly and weekly production of bituminous coal and lignite. The estimates given are based upon the latest information available and differ in some instances from the current figures published in the Weekly Coal Reports.

TABLE 4.—Bituminous-coal and lignite production (final figures) in the United States in 1949, with estimates by months

Month	Production (net tons)	Maximum number of working days	Average production per working day (net tons)	Month	Production (net tons)	Maximum number of working days	Average production per working day (net tons)
January	49, 011, 000	25. 1	1, 953, 000	July	27, 228, 000	25	1, 089, 000
February	46, 490, 000	24	1, 937, 000	August	37, 914, 000	27	1, 404, 000
March	33, 991, 000	27	1, 259, 000	September	19, 965, 000	25	799, 000
April	47, 633, 000	25	1, 905, 000	October	10, 545, 000	26	406, 000
May	48, 039, 000	25. 4	1, 891, 000	November	45, 037, 000	25. 3	1, 780, 000
June	35, 680, 000	26	1, 372, 000	December	36, 335, 000	26	1, 398, 000
				Total	437, 868, 000	306. 8	1, 427, 000

TABLE 5.—Coal production in the United States in 1949, by States (final figures), with estimates by months, in thousands of net tons

[Totals for year are based on final complete returns from all operators known to have produced 1,000 tons and over per year. In most cases monthly apportionment is based on current records of railway carloadings and waterway shipments; in some States upon direct tonnage reports by operators to State mine departments]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	1,593	1,458	990	1,558	1,586	994	721	1,133	531	109	1,180	1,081	12,934
Alaska	30	31	36	34	38	39	22	31	24	37	55	57	434
Arkansas	113	117	96	53	43	46	34	70	60	95	141	94	962
Colorado	674	633	475	291	284	234	144	296	242	430	546	387	4,636
Illinois	5,670	5,666	3,895	4,545	4,410	3,646	3,072	3,759	2,127	1,528	5,129	3,761	47,208
Indiana	2,106	2,034	1,232	1,866	1,486	1,461	1,061	1,515	608	95	1,908	1,178	16,550
Iowa	163	168	163	143	81	129	135	163	131	115	185	149	1,725
Kansas	211	203	201	124	120	124	110	201	130	191	244	172	2,031
Kentucky:													
Eastern	4,609	4,209	2,925	5,208	5,527	3,790	2,906	4,219	1,833	451	4,954	3,923	44,554
Western	1,503	1,441	1,588	1,523	1,493	1,484	1,046	1,691	1,226	1,156	2,120	1,758	18,029
Total Kentucky	6,112	5,650	4,513	6,731	7,020	5,274	3,952	5,910	3,059	1,607	7,074	5,681	62,583
Maryland	93	82	57	79	57	63	40	44	27	7	66	53	668
Missouri	378	364	360	225	216	223	199	361	234	341	438	308	3,647
Montana:													
Bituminous	268	274	252	174	204	208	169	285	202	198	247	240	2,721
Lignite	5	5	4	3	3	3	3	5	3	3	4	4	45
Total Montana	273	279	256	177	207	211	172	290	205	201	251	244	2,766
New Mexico	128	128	123	107	77	66	62	86	43	59	74	51	1,004
North Dakota (lignite)	282	303	232	145	154	134	137	185	301	398	350	346	2,967
Ohio	3,078	2,886	2,426	3,052	2,815	2,501	1,823	2,727	1,801	1,040	3,741	3,071	30,961
Oklahoma	355	361	306	165	134	142	107	223	191	302	437	299	3,022
Pennsylvania (bituminous)	10,965	10,420	7,102	10,545	10,629	7,238	5,103	7,347	3,620	1,289	7,939	7,018	89,215
South Dakota (lignite)	3	3	2	1	1	1	1	2	3	3	3	3	26
Tennessee	454	421	305	495	497	378	249	413	154	15	397	394	4,172
Texas (lignite)	6	6	5	4	4	2	3	3	4	4	4	4	49
Utah	707	683	759	551	514	378	280	559	255	438	696	340	6,160
Virginia	1,409	1,247	1,013	1,680	1,716	1,247	878	1,368	741	407	1,665	1,213	14,584
Washington	107	91	89	74	61	59	56	71	46	87	88	70	899
West Virginia	13,470	12,678	8.765	14.656	15,418	10,727	8,497	10,650	5,199	1,040	11,606	9,904	122,610
Wyoming	623	571	584	330	468	360	369	504	226	703	813	450	6,001
Other States [1]	8	7	6	2	3	3	1	3	3	4	7	7	54
Total bituminous coal and lignite	49,011	46,490	33,991	47,633	48,039	35,680	27,228	37,914	19,965	10,545	45,037	36.335	437,868
Pennsylvania anthracite	3,725	2,930	2.375	3,725	4,407	3,406	3,925	3,710	2,114	4,979	4,657	2,749	42,702
Grand total 1949	52,736	49,420	36,366	51,358	52,446	39,086	31,153	41,624	22,079	15,524	49,694	39,084	480,570

[1] Comprises Arizona, California, Georgia, Idaho, Michigan, and North Carolina.

TABLE 6.—Estimated monthly production of bituminous coal and lignite in 1950, by States, in thousands of net tons

[Figures based principally on railroad carloadings and river shipments of coal and beehive coke. Allowance is made for all mines producing 1,000 tons or over per year]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	814	185	1,470	1,496	1,526	1,485	1,045	1,432	1,418	1,348	1,425	1,486	15,130
Alaska	46	37	63	35	27	16	10	21	26	48	32	32	393
Arkansas	114	85	121	45	51	57	49	97	104	101	92	100	1,016
Colorado	432	126	449	234	274	216	180	379	451	458	552	534	4,285
Illinois	3,436	1,177	5,735	4,835	4,588	4,934	3,560	5,201	5,181	5,616	5,356	5,727	55,346
Indiana	1,188	168	2,146	1,724	1,850	1,841	1,363	1,860	1,958	2,125	2,047	2,100	20,370
Iowa	174	183	272	182	121	131	96	123	116	137	170	195	1,900
Kansas	155	114	165	120	118	109	105	135	148	155	183	215	1,722
Kentucky:													
Eastern	3,796	2,014	6,063	4,876	4,865	4,872	3,833	5,431	5,294	5,599	4,659	4,598	55,900
Western	1,618	1,476	2,368	1,748	1,718	1,710	1,412	1,982	1,840	2,076	1,967	2,085	22,000
Maryland	81	48	87	43	24	30	29	38	31	36	24	29	500
Missouri	277	204	295	215	213	197	190	241	265	278	327	386	3,088
Montana (bituminous and lignite)	216	227	274	153	167	167	159	220	170	243	233	237	2,466
New Mexico	55	11	78	50	40	45	38	71	64	66	71	78	667
North and South Dakota (lignite)	341	303	259	196	156	161	159	230	253	393	399	370	3,220
Ohio	2,145	1,367	4,221	3,484	3,313	3,491	2,779	3,723	2,997	3,470	2,862	3,094	36,946
Oklahoma	341	257	358	137	152	169	147	293	312	301	284	299	3,050
Pennsylvania (bituminous)	4,592	1,598	10,470	10,020	9,783	10,030	7,370	10,360	9,452	10,420	8,959	9,446	102,500
Tennessee	410	204	653	455	415	426	291	491	435	471	408	441	5,100
Texas (lignite)	2	2	2	2	1	1	1	1	2	2	2	2	20
Utah	404	46	646	687	529	490	417	701	645	599	631	545	6,340
Virginia	1,229	529	1,969	1,574	1,464	1,551	1,196	1,742	1,623	1,815	1,421	1,587	17,700
Washington	68	30	67	77	80	78	51	83	74	88	94	82	872
West Virginia:													
Southern [1]	6,568	882	10,058	9,413	9,456	8,866	6,846	10,315	9,620	10,366	8,742	8,612	99,744
Northern [2]	2,238	754	4,782	4,403	4,381	4,252	3,468	4,407	4,276	4,442	3,890	4,528	45,821
Wyoming	407	114	519	407	482	495	312	503	539	719	678	685	5,860
Other States [3]	4	4	4	4	4	3	3	3	3	4	4	4	44
Total 1950	31,151	12,145	53,594	46,615	45,798	45,823	35,109	50,083	47,297	51,376	45,512	47,497	512,000
Days and average production:													
Maximum number of working days	25	24	27	24.5	26.5	26	25	27	25	26	25	25	306.0
Average production per working day	1,246	506	1,985	1,903	1,728	1,762	1,404	1,855	1,892	1,976	1,820	1,900	1,673

[1] Includes operations on the N. & W., C. & O., Virginian, T. & O. C., B. C. & G., and on the B. & O. in Kanawha, Mason, and Clay Counties

[2] Rest of State, including the Panhandle District and Grant, Mineral, and Tucker Counties.

[3] Comprises Arizona, Georgia, Michigan, and North Carolina.

TABLE 7.—Bituminous-coal and lignite production (final figures) in the United States in 1949, with estimates by weeks

Week ended—	Production (net tons)	Maximum number of working days	Average production per working day (net tons)	Week ended—	Production (net tons)	Maximum number of working days	Average production per working day (net tons)
Jan. 1	[1] 75,000	[1] 0.1	[2] 1,770,000	July 16	6,948,000	6	1,158,000
Jan. 8	12,022,000	6	2,004,000	July 23	7,320,000	6	1,220,000
Jan. 15	12,238,000	6	2,040,000	July 30	7,697,000	6	1,283,000
Jan. 22	11,915,000	6	1,986,000	Aug. 6	7,582,000	6	1,264,000
Jan. 29	10,891,000	6	1,815,000	Aug. 13	8,031,000	6	1,339,000
Feb. 5	11,896,000	6	1,983,000	Aug. 20	7,584,000	6	1,264,000
Feb. 12	11,972,000	6	1,995,000	Aug. 27	7,944,000	6	1,324,000
Feb. 19	11,345,000	6	1,891,000	Sept. 3	8,140,000	6	1,357,000
Feb. 26	11,368,000	6	1,895,000	Sept. 10	6,212,000	5	1,242,000
Mar. 5	10,678,000	6	1,780,000	Sept. 17	8,775,000	6	1,463,000
Mar. 12	10,755,000	6	1,793,000	Sept. 24	2,002,000	6	334,000
Mar. 19	3,006,000	6	501,000	Oct. 1	1,803,000	6	301,000
Mar. 26	2,444,000	6	407,000	Oct. 8	2,192,000	6	365,000
Apr. 2	9,998,000	5	2,000,000	Oct. 15	2,369,000	6	395,000
Apr. 9	11,503,000	6	1,917,000	Oct. 22	2,528,000	6	421,000
Apr. 16	11,674,000	6	1,946,000	Oct. 29	2,770,000	6	462,000
Apr. 23	11,567,000	6	1,928,000	Nov. 5	2,742,000	6	457,000
Apr. 30	11,778,000	6	1,963,000	Nov. 12	7,276,000	6	1,213,000
May 7	11,342,000	6	1,890,000	Nov. 19	14,583,000	6	2,431,000
May 14	11,198,000	6	1,866,000	Nov. 26	13,030,000	5.3	2,458,000
May 21	11,271,000	6	1,879,000	Dec. 3	9,548,000	6	1,591,000
May 28	11,427,000	6	1,905,000	Dec. 10	9,605,000	6	1,601,000
June 4	10,145,000	5.4	1,879,000	Dec. 17	9,052,000	6	1,509,000
June 11	13,144,000	6	2,191,000	Dec. 24	9,390,000	6	1,565,000
June 18	2,202,000	6	367,000	Dec. 31	6,638,000	5	1,328,000
June 25	12,003,000	6	2,001,000				
July 2	1,308,000	6	218,000	Total 1949	437,868,000	306.8	1,427,000
July 9	4,942,000	5	988,000				

[1] Figures represent output and number of working days in that part of the week included in the calendar year shown. Total production for the week ended Jan. 1, 1949, was 9,029,000 net tons.
[2] Average daily production for entire week and not for working days in the calendar year shown.

FIGURE 3.—Production of bituminous coal and lignite in the United States, by weeks, 1949–50.

TABLE 8.—Estimated weekly production of bituminous coal and lignite in the United States in 1950

Week ended—	Production (net tons)	Maximum number of working days	Average production per working day (net tons)	Week ended—	Production (net tons)	Maximum number of working days	Average production per working day (net tons)
Jan. 7	5,591,000	5	1,118,000	July 15	9,074,000	6	1,512,000
Jan. 14	7,366,000	6	1,228,000	July 22	11,195,000	6	1,866,000
Jan. 21	7,242,000	6	1,207,000	July 29	10,714,000	6	1,786,000
Jan. 28	7,491,000	6	1,249,000	Aug. 5	10,563,000	6	1,761,000
Feb. 4	6,617,000	6	1,103,000	Aug. 12	10,900,000	6	1,817,000
Feb. 11	2,676,000	6	446,000	Aug. 19	11,301,000	6	1,884,000
Feb. 18	2,492,000	6	415,000	Aug. 26	11,005,000	6	1,834,000
Feb. 25	2,709,000	6	452,000	Sept. 2	11,060,000	6	1,843,000
Mar. 4	3,181,000	6	530,000	Sept. 9	10,173,000	5	2,035,000
Mar. 11	13,482,000	6	2,247,000	Sept. 16	11,383,000	6	1,897,000
Mar. 18	13,676,000	6	2,279,000	Sept. 23	11,532,000	6	1,922,000
Mar. 25	12,765,000	6	2,128,000	Sept. 30	11,610,000	6	1,935,000
Apr. 1	12,197,000	5.5	2,218,000	Oct. 7	11,486,000	6	1,914,000
Apr. 8	11,725,000	6	1,954,000	Oct. 14	11,573,000	6	1,929,000
Apr. 15	11,584,000	6	1,931,000	Oct. 21	11,828,000	6	1,971,000
Apr. 22	11,386,000	6	1,898,000	Oct. 28	11,724,000	6	1,954,000
Apr. 29	11,325,000	6	1,888,000	Nov. 4	11,535,000	6	1,923,000
May 6	10,983,000	6	1,831,000	Nov. 11	11,145,000	6	1,858,000
May 13	10,102,000	6	1,684,000	Nov. 18	12,003,000	6	2,001,000
May 20	9,743,000	6	1,624,000	Nov. 25	9,168,000	5	1,834,000
May 27	10,228,000	6	1,705,000	Dec. 2	9,413,000	6	1,569,000
June 3	9,326,000	5.5	1,696,000	Dec. 9	11,576,000	6	1,929,000
June 10	10,529,000	6	1,755,000	Dec. 16	12,194,000	6	2,032,000
June 17	10,364,000	6	1,727,000	Dec. 23	11,205,000	6	1,868,000
June 24	10,546,000	6	1,758,000	Dec. 30	9,535,000	5	1,907,000
July 1	10,182,000	6	1,697,000				
July 8	1,597,000	5	319,000	Total 1950	512,000,000	306.0	1,673,000

SUMMARY BY STATES

Details on the bituminous-coal and lignite industry, by States and counties, are presented in other parts of this chapter, notably in table 34.

TABLE 9.—Coal produced in the United States, by States, 1940–49, with production of maximum year and cumulative production from earliest record to end of 1949, in thousands of net tons

State	Maximum production		Production by years										Total production from earliest record to end of 1949
	Year	Quantity	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	
Alabama	1926	21,001	15,324	15,464	19,301	17,160	18,752	18,236	16,183	19,048	18,801	12,934	822,278
Arkansas	1907	2,670	1,454	1,574	1,985	1,718	1,972	1,854	1,631	1,871	1,662	962	91,376
Colorado	1917	12,483	6,589	6,949	8,086	8,324	8,168	7,621	5,914	6,358	5,631	4,636	471,121
Georgia	1903	416	(1)	(1)	31	14	24	43	114	7	20	(1)	(1)
Illinois	1918	89,291	50,610	54,703	65,071	72,631	76,792	73,011	63,469	67,860	65,342	47,208	3,131,283
Indiana	1918	30,679	18,869	22,484	25,388	25,065	27,962	25,183	21,697	25,449	23,849	16,550	985,288
Iowa	1917	8,966	3,231	2,939	2,948	2,771	2,141	2,046	1,788	1,684	1,670	1,725	337,733
Kansas	1918	7,562	3,579	4,008	4,230	3,437	3,369	3,228	2,493	2,745	2,538	2,031	266,051
Kentucky	1947	84,241	49,141	53,710	62,231	63,211	71,356	69,593	66,553	84,241	82,084	62,583	1,955,774
Maryland	1907	5,533	1,503	1,701	2,001	1,933	1,870	1,763	2,003	2,051	1,661	668	259,825
Michigan	1907	2,036	410	311	231	169	140	126	80	14	13	12	46,373
Missouri	1917	5,671	3,097	3,145	3,520	4,310	4,779	3,983	3,733	4,236	4,023	3,647	257,468
Montana (bituminous and lignite)	1944	4,844	2,867	3,254	3,829	4,833	4,844	4,467	3,723	3,178	2,898	2,766	157.263
New Mexico	1918	4,023	1,111	1,251	1,669	1,851	1,744	1.484	1,280	1.443	1,364	1,004	121,440
North Carolina	1922	79	----	----	----	----	----	----	----	----	----	(1)	(1)
North Dakota (lignite)	1949	2,967	2,218	2,309	2,537	2,500	2,366	2,522	2,555	2,760	2.961	2,967	67,640
Ohio	1920	45,878	22,772	29,319	32,764	32,255	33,877	32,737	32,314	37,548	38,708	30,961	1,697,682
Oklahoma	1920	4,849	1,646	1,771	2,387	2,838	3,209	2,909	2,647	3,421	3,462	3,022	158,775
Pennsylvania (bituminous)	1918	178,551	116,603	130,240	144,073	141,050	146,052	132,965	125,497	147,079	134,542	89,215	7,365,791
Tennessee	1942	8,158	6,008	7,045	8,158	7,179	7,266	6,271	5,618	6,258	6,483	4,172	324,312
Texas (bituminous and lignite)	1913	2,429	621	353	304	153	[2] 109	[2] 80	[2] 56	[2] 61	[2] 57	[2] 49	60,911
Utah	1947	7,429	3,576	4.077	5,517	6,666	7,119	6,679	5,994	7,429	6,813	6,160	197,866
Virginia	1943	20,280	15,348	18,441	20,136	20,280	19,514	17,235	15,527	20,171	17,999	14,584	554,123
Washington	1918	4,082	1,650	1,841	1,953	1,528	1,524	1,357	991	1,118	1,220	899	142,449
West Virginia	1947	176,157	126,438	140,250	155,882	158,804	164,704	152,035	144,020	176,157	168.862	122.610	4,961,743
Wyoming	1945	9,847	5,808	6,646	8,133	9,155	9,540	9,847	7,635	8,051	6,412	6,001	363,461
Other States	----	----	299	364	328	342	383	342	407	386	443	502	65,979
Total bituminous and lignite	1947	630,624	460.772	514,149	582,693	590,177	619,576	577,617	533,922	630,624	599,518	437,868	24,864,005
Pennsylvania anthracite	1917	99,612	51,485	56,368	60,328	60,644	63,701	54,934	60,507	57,190	57,140	42,702	4,898,943
Grand total	----	----	512,257	570,517	643,021	650,821	683,277	632,551	594,429	687,814	656,658	480,570	29,762,948

[1] Included with "Other States."
[2] Lignite only.

TABLE 10.—Number of mines, production, value, employment, days active, man-days, and output per day at bituminous-coal and lignite mines in the United States, by States, in 1949

[Exclusive of mines producing less than 1,000 tons]

State	Number of active mines	Disposition of coal produced (net tons)					Average value per ton [3]	Average number of men working daily				Average number of days worked	Number of man-days worked	Average tons per man per day
		Shipped by rail or water [1]	Trucked to railroad or waterway for further shipment	Shipped by truck	Used at mine [2]	Total quantity		Underground	Surface: In strip pits	Surface: All others	Total			
Alabama	426	9,907,561	1,073,363	1,588,604	364,302	12,933,830	6.12	17,357	885	3,633	21,875	153	3,342,674	3.87
Alaska	7	422,977		5,703	4,853	433,533	7.63	153	77	84	314	263	82,477	5.26
Arizona	1			4,850		4,850	4.85	9			9	237	2,137	2.27
Arkansas	56	783,146	156,914	16,875	4,576	961,511	7.84	1,647	211	366	2,224	125	277,778	3.46
California (lignite)	1			3,900		3,900	10.00		3		3	156	468	8.33
Colorado	171	3,018,294	340,472	1,139,389	138,277	4,636,432	5.12	4,031	137	1,071	5,239	164	857,916	5.40
Idaho	1			3,219		3,219	7.78	10		2	12	180	2,160	1.49
Illinois	299	39,803,667	470,012	6,007,112	927,168	47,207,959	4.04	21,759	2,209	8,823	32,791	163	5,359,627	8.81
Indiana	117	14,504,439	264,785	1,396,450	384,082	16,549,756	4.05	5,457	2,233	2,519	10,209	152	1,551,566	10.67
Iowa	121	533,422	215,952	972,460	2,650	1,724,484	4.01	1,275	358	320	1,953	171	333,108	5.18
Kansas	54	1,842,965	38,635	141,105	8,412	2,031,117	3.92	362	474	315	1,151	167	192,668	10.54
Kentucky	2,360	42,482,508	8,802,720	10,875,639	422,397	62,583,264	5.04	55,983	1,796	11,356	69,135	145	9,993,310	6.26
Maryland	77	371,410	91,632	202,755	2,535	668,332	5.24	1,151	68	191	1,410	119	168,320	3.97
Michigan	1			9,843	1,607	11,450	10.12	24		4	28	175	4,900	2.34
Missouri	90	2,936,667	5,484	700,920	4,385	3,647,456	4.09	724	547	474	1,745	194	338,377	10.78
Montana:														
Bituminous	18	2,606,045	31,679	70,953	12,258	2,720,935	2.26	493	68	227	788	195	153,931	17.68
Lignite	8			45,050	18	45,068	3.35	29	6	8	43	167	7,192	6.27
Total Montana	26	2,606,045	31,679	116,003	12,276	2,766,003	2.28	522	74	235	831	194	161,123	17.17
New Mexico	18	898,956	27,466	44,826	32,786	1,004,034	5.21	967		226	1,193	170	203,370	4.94
North Dakota (lignite)	43	2,320,556	45,489	508,714	92,501	2,967,260	2.36	133	260	244	637	238	151,639	19.57
Ohio	665	19,964,286	2,658,841	8,065,609	271,801	30,960,537	3.97	12,509	4,137	4,461	21,107	154	3,255,980	9.51
Oklahoma	76	2,607,569	217,526	188,470	8,294	3,021,859	5.04	1,393	612	453	2,458	178	438,133	6.90
Pennsylvania	1,889	59,771,665	11,875,078	11,909,689	5,658,171	89,214,603	5.01	74,962	9,108	15,197	99,267	159	15,745,258	5.67
South Dakota (lignite)	2		620	25,809		26,429	3.47		15	2	17	250	4,245	6.23
Tennessee	156	3,466,582	275,923	388,595	41,172	4,172,272	5.22	5,774	275	973	7,022	139	979,319	4.26
Texas (lignite)	1	49,213			260	49,473	1.02		10	6	16	223	3,560	13.90
Utah	69	5,229,093	255,626	483,095	191,778	6,159,592	4.77	3,580		1,230	4,810	195	937,807	6.57
Virginia	335	10,711,229	3,082,685	518,599	271,574	14,584,087	5.65	15,313	340	2,688	18,341	156	2,868,341	5.08

Washington	31	624.971	34,583	220,689	18,803	899,046	6.71	819	86	286	1,191	194	231,351	3.89
West Virginia	1,410	106,364,994	11,516,595	2,072,292	2,656,697	122,610,578	5.30	97,916	5,191	21,643	124,750	159	19,881,637	6.17
Wyoming	46	5,719,158	2,749	149,151	129,866	6,000,924	3.83	2,840	161	855	3,856	191	734,773	8.17
Other States:														
Georgia and North Carolina	10	------------	4,100	26,146	------------	30,246	6.70	88	--------	16	104	249	25,875	1.17
Total 1949	8,559	336,941,373	41,488,929	47,786,511	11,651,223	437,868,036	4.88	326,758	29,267	77,673	433,698	157	68,129,897	6.43

1 Includes coal loaded at mine directly into railroad cars or river barges.

2 Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, transported from mine to point of use by conveyor or tram, made into beehive coke at mine, and all other uses at mine.

3 Value received or charged for coal, f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked [not coke] as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

NUMBER AND SIZE OF MINES

TABLE 11.—Number and production of bituminous-coal and lignite mines in the United States, classified by size of output in each State, in 1949

[Exclusive of mines producing less than 1,000 tons]

State	Class 1A—500,000 tons and over				Class 1B—200,000 to 500,000 tons				Class 2—100,000 to 200,000 tons			
	Mines		Production		Mines		Production		Mines		Production	
	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent
Alabama	3	0.7	1,852,268	14.3	11	2.6	3,549,698	27.5	20	4.7	2,783,255	21.5
Alaska	----	----	----	----	----	----	----	----	2	28.6	334,759	77.2
Colorado	----	----	----	----	2	1.2	694,306	15.0	9	5.2	1,258,393	27.1
Illinois	35	11.7	28,344,765	60.0	38	12.7	13,512,502	28.6	10	3.3	1,393,788	3.0
Indiana	6	5.1	4,294,329	25.9	27	23.1	9,359,717	56.6	9	7.7	1,184,413	7.2
Iowa	----	----	----	----	1	.8	220,272	12.7	1	.8	129,638	7.5
Kansas	----	----	----	----	4	7.4	1,358,121	66.9	3	5.6	408,561	20.1
Kentucky	16	.7	13,292,818	21.2	48	2.0	13,542,240	21.6	79	3.3	10,907,483	17.5
Maryland	----	----	----	----	----	----	----	----	1	1.3	130,911	19.6
Missouri	2	2.2	1,530,872	42.0	3	3.3	1,082,490	29.7	2	2.2	253,343	6.9
Montana (bituminous) [1]	1	5.5	1,819,342	66.9	1	5.5	389,782	14.3	2	11.1	306,472	11.3
New Mexico	----	----	----	----	2	11.1	666,939	66.4	----	----	----	----
Ohio	12	1.8	9,545,652	30.8	19	2.8	6,214,277	20.1	35	5.3	4,917,316	15.9
Oklahoma	----	----	----	----	4	5.3	1,010,342	33.4	5	6.6	840,733	27.8
Pennsylvania	35	1.9	28,502,248	32.0	53	2.8	16,678,213	18.7	101	5.3	14,051,088	15.7
Tennessee	----	----	----	----	2	1.3	443,854	10.6	11	7.0	1,426,023	34.2
Utah	4	5.8	2,783,874	45.2	5	7.2	1,690,683	27.4	6	8.7	909,818	14.8
Virginia	4	1.2	2,737,344	18.8	13	3.9	3,899,537	26.7	21	6.3	3,028,866	20.8
Washington	----	----	----	----	----	----	----	----	3	9.7	467,756	52.0
West Virginia	41	2.9	30,214,422	24.6	139	9.8	41,392,591	33.8	171	12.1	24,740,493	20.2
Wyoming	4	8.7	2,795,440	46.6	5	10.9	1,864,651	31.1	6	13.0	915,689	15.2
Other States: California, Montana, North Dakota, South Dakota, and Texas [2]	1	1.8	512,398	16.6	6	10.9	1,965,337	63.6	----	----	----	----
Total 1949	164	1.9	128,225,772	29.3	383	4.5	119,535,552	27.3	497	5.8	70,388,798	16.1

State	Class 3—50,000 to 100,000 tons				Class 4—10,000 to 50,000 tons				Class 5—Less than 10,000 tons				Total		
	Mines		Production		Mines		Production		Mines		Production		Mines	Production (net tons)	
	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent	Number	Percent	Net tons	Percent		Total	Average per mine
Alabama	30	7.0	2,125,967	16.4	69	16.2	1,608,807	12.5	293	68.8	1,013,835	7.8	426	12,933,830	30,361
Alaska	1	14.3	57,451	13.3	1	14.3	23,670	5.4	3	42.8	17,653	4.1	7	433,533	61,933
Arizona	---	---	---	---	---	---	---	---	1	100.0	4,850	100.0	1	4,850	4,850
Arkansas	5	8.9	293,999	30.6	19	33.9	564,655	58.7	32	57.2	102,857	10.7	56	961,511	17,170
Colorado	19	11.1	1,316,012	28.4	41	24.0	1,005,999	21.7	100	58.5	361,722	7.8	171	4,636,432	27,114
Idaho	---	---	---	---	---	---	---	---	1	100.0	3,219	100.0	1	3,219	3,219
Illinois	25	8.4	1,640,717	3.5	85	28.4	1,873,557	4.0	106	35.5	442,630	.9	299	47,207,959	157,886
Indiana	12	10.2	901,273	5.4	25	21.4	662,194	4.0	38	32.5	147,830	.9	117	16,549,756	141,451
Iowa	2	1.7	131,932	7.7	47	38.8	922,658	53.5	70	57.9	319,984	18.6	121	1,724,484	14,252
Kansas	---	---	---	---	6	11.1	99,122	4.9	41	75.9	165,313	8.1	54	2,031,117	37,613
Kentucky	93	4.0	6,699,180	10.7	372	15.8	8,521,435	13.6	1,752	74.2	9,620,108	15.4	2,360	62,583,264	26,518
Maryland	2	2.6	148,463	22.2	10	13.0	194,728	29.1	64	83.1	194,230	29.1	77	668,332	8,680
Michigan	---	---	---	---	1	100.0	11,450	100.0	---	---	---	---	1	11,450	11,450
Missouri	4	4.5	281,428	7.7	11	12.2	226,945	6.2	68	75.6	272,378	7.5	90	3,647,456	40,527
Montana (bituminous) [1]	1	5.6	94,732	3.5	3	16.7	65,760	2.4	10	55.6	44,847	1.6	18	2,720,935	151,163
New Mexico	3	16.7	205,001	20.4	5	27.8	103,983	10.4	8	44.4	28,111	2.8	18	1,004,034	55,780
Ohio	57	8.6	4,144,207	13.4	204	30.7	4,860,444	15.7	338	50.8	1,278,641	4.1	665	30,960,537	46,557
Oklahoma	9	11.8	606,605	20.1	17	22.4	428,622	14.2	41	53.9	135,557	4.5	76	3,021,859	39,761
Pennsylvania	172	9.1	12,227,158	13.7	618	32.7	13,825,423	15.5	910	48.2	3,930,473	4.4	1,889	89,214,603	47,228
Tennessee	19	12.2	1,402,853	33.6	21	13.5	506,808	12.2	103	66.0	392,734	9.4	156	4,172,272	26,745
Utah	3	4.3	214,724	3.5	21	30.5	446,236	7.2	30	43.5	114,257	1.9	69	6,159,592	89,269
Virginia	23	6.9	1,700,954	11.7	103	30.7	2,118,217	14.5	171	51.0	1,099,169	7.5	335	14,584,087	43,535
Washington	1	3.2	76,653	8.6	14	45.2	304,985	33.9	13	41.9	49,652	5.5	31	899,046	29,001
West Virginia	180	12.8	12,934,914	10.5	435	30.9	11,121,484	9.1	444	31.5	2,206,674	1.8	1,410	122,610,578	86,958
Wyoming	2	4.4	173,347	2.9	7	15.2	175,844	2.9	22	47.8	75,953	1.3	46	6,000,924	130,455
Other States:															
Georgia and North Carolina	---	---	---	---	1	10.0	13,646	45.1	9	90.0	16,600	54.9	10	30,246	3,025
California, Montana, North Dakota, South Dakota, and Texas [2]	3	5.5	214,316	6.9	12	21.8	257,136	8.3	33	60.0	142,943	4.6	55	3,092,130	56,221
Total 1949	666	7.8	47,591,886	10.9	2,148	25.1	49,943,808	11.4	4,701	54.9	22,182,220	5.0	8,559	437,868,036	51,159

[1] Lignite included with "Other States."
[2] Lignite only. Production mostly from North Dakota.

[4] See also tables 3, 10, 14, 19, 45, and 47.

EMPLOYMENT AND PRODUCTIVITY[5]

TABLE 12.—Growth of the bituminous-coal- and lignite-mining industry in the United States, 1890–1949

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons per man—		Percent of underground production—		Percent of total production—	
				Per day	Per year	Cut by machines [1]	Mechanically loaded	Mechanically cleaned [2]	Mined by stripping
1890	192,204	226	(3)	2.56	579	(3)	(3)	(3)	(3)
1891	205,803	223	(3)	2.57	573	5.3	(3)	(3)	(3)
1892	212,893	219	(3)	2.72	596	(3)	(3)	(3)	(3)
1893	230,365	204	(3)	2.73	557	(3)	(3)	(3)	(3)
1894	244,603	171	(3)	2.84	486	(3)	(3)	(3)	(3)
1895	239,962	194	(3)	2.90	563	(3)	(3)	(3)	(3)
1896	244,171	192	(3)	2.94	564	11.9	(3)	(3)	(3)
1897	247,817	196	(3)	3.04	596	15.3	(3)	(3)	(3)
1898	255,717	211	(3)	3.09	651	19.5	(3)	(3)	(3)
1899	271,027	234	46	3.05	713	22.7	(3)	(3)	(3)
1900	304,375	234	43	2.98	697	24.9	(3)	(3)	(3)
1901	340,235	225	35	2.94	664	25.6	(3)	(3)	(3)
1902	370,056	230	44	3.06	703	26.8	(3)	(3)	(3)
1903	415,777	225	28	3.02	680	27.6	(3)	(3)	(3)
1904	437,832	202	44	3.15	637	28.2	(3)	(3)	(3)
1905	460,629	211	23	3.24	684	32.8	(3)	(3)	(3)
1906	478,425	213	63	3.36	717	34.7	(3)	2.7	(3)
1907	513,258	234	14	3.29	769	35.1	(3)	2.9	(3)
1908	516,264	193	38	3.34	644	37.0	(3)	3.6	(3)
1909	543,152	209	29	3.34	699	37.5	(3)	3.8	(3)
1910	555,533	217	89	3.46	751	41.7	(3)	3.8	(3)
1911	549,775	211	27	3.50	738	43.9	(3)	(3)	(3)
1912	548,632	223	35	3.68	820	46.8	(3)	3.9	(3)
1913	571,882	232	36	3.61	837	50.7	(3)	4.6	(3)
1914	583,506	195	80	3.71	724	51.8	(3)	4.8	0.3
1915	557,456	203	61	3.91	794	55.3	(3)	4.7	.6
1916	561,102	230	26	3.90	896	56.9	(3)	4.6	.8
1917	603,143	243	17	3.77	915	56.1	(3)	4.6	1.0
1918	615,305	249	7	3.78	942	56.7	(3)	3.8	1.4
1919	621,998	195	37	3.84	749	60.0	(3)	3.6	1.2
1920	639,547	220	22	4.00	881	60.7	(3)	3.3	1.5
1921	663,754	149	23	4.20	627	66.4	(3)	3.4	1.2
1922	687,958	142	117	4.28	609	64.8	(3)	(3)	2.4
1923	704,793	179	20	4.47	801	68.3	0.3	3.8	2.1
1924	619,604	171	73	4.56	781	71.5	.7	(3)	2.8
1925	588,493	195	30	4.52	884	72.9	1.2	(3)	3.2
1926	593,647	215	24	4.50	966	73.8	1.9	(3)	3.0
1927	593,918	191	153	4.55	872	74.9	3.3	5.3	3.6
1928	522,150	203	83	4.73	959	76.9	4.5	5.7	4.0
1929	502,993	219	11	4.85	1,064	78.4	7.4	6.9	3.8
1930	493,202	187	43	5.06	948	81.0	10.5	8.3	4.3
1931	450,213	160	35	5.30	849	83.2	13.1	9.5	5.0
1932	406,380	146	120	5.22	762	84.1	12.3	9.8	6.3
1933	418,703	167	30	4.78	797	84.7	12.0	10.4	5.5
1934	458,011	178	15	4.40	785	84.1	12.2	11.1	5.8
1935	462,403	179	[4] 7	4.50	805	84.2	13.5	12.2	6.4
1936	477,204	199	21	4.62	920	84.8	16.3	13.9	6.4
1937	491,864	193	[4] 19	4.69	906	(3)	20.2	14.6	7.1
1938	441,333	162	13	4.89	790	87.5	26.7	18.2	8.7
1939	421,788	178	36	5.25	936	87.9	31.0	20.1	9.6
1940	439,075	202	8	5.19	1,049	88.4	35.4	22.2	9.4
1941	456,981	216	27	5.20	1,125	89.0	40.7	22.9	10.7
1942	461,991	246	7	5.12	1,261	89.7	45.2	24.4	11.5
1943	416,007	264	[4] 15	5.38	1,419	90.3	48.9	24.7	13.5
1944	393,347	278	[4] 5	5.67	1,575	90.5	52.9	25.6	16.3

See footnotes at end of table.

[5] See also tables 3, 4, 7, 8, 10, 14, 19, 44, 45, and 47.

TABLE 12.—Growth of the bituminous-coal- and lignite-mining industry in the United States, 1890-1949—Continued

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons per man— Per day	Net tons per man— Per year	Percent of underground production— Cut by machines [1]	Percent of underground production— Mechanically loaded	Percent of total production— Mechanically cleaned [2]	Percent of total production— Mined by stripping
1945	383,100	261	[4] 9	5.78	1,508	90.8	56.1	25.6	19.0
1946	[5] 396,434	214	[4] 23	6.30	1,347	90.8	58.4	26.0	21.1
1947	[5] 419,182	234	[4] 5	6.42	1,504	90.0	60.7	27.7	22.1
1948	[5] 441,631	217	[4] 16	6.26	1,358	90.7	64.3	30.2	23.3
1949	[5] 433,698	157	[4] 15	6.43	1,010	91.4	67.0	35.1	24.2

[1] Percentages for 1890 to 1913, inclusive, are of total production, as a separation of strip and underground production is not available for those years.
[2] For 1906 to 1926, inclusive, these percentages are exclusive of coal cleaned at central washeries operated by consumers.
[3] Data not available.
[4] Bureau of Labor Statistics, U. S. Department of Labor.
[5] Average number of men working daily.

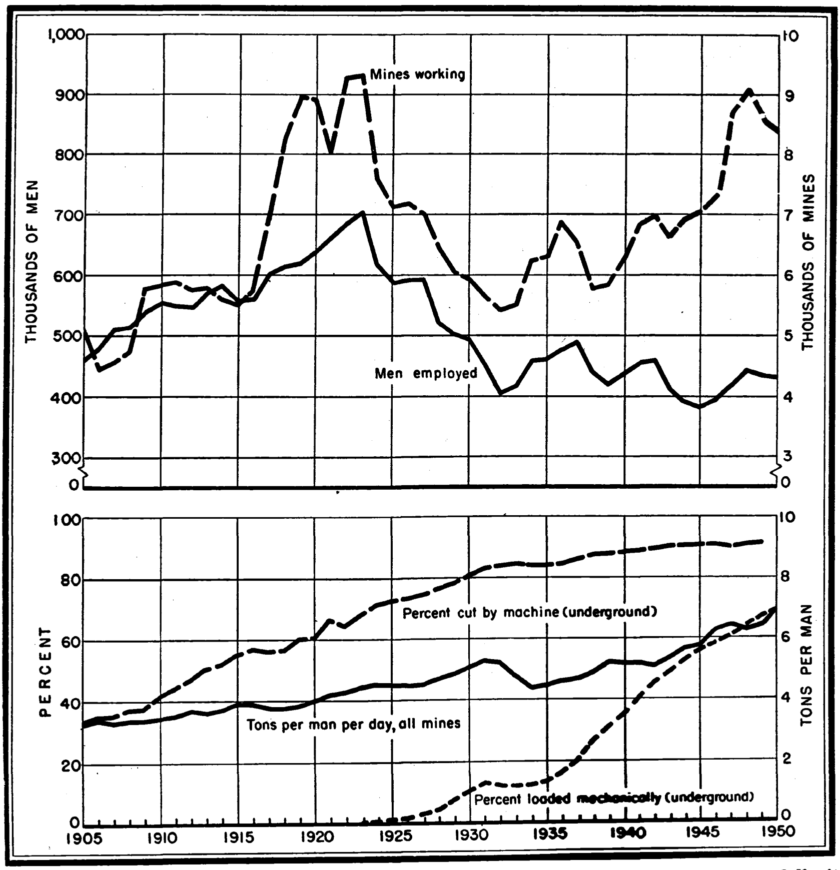

FIGURE 4.—Trends of employment, mechanization, and output per man at bituminous-coal and lignite mines in the United States, 1905-50.

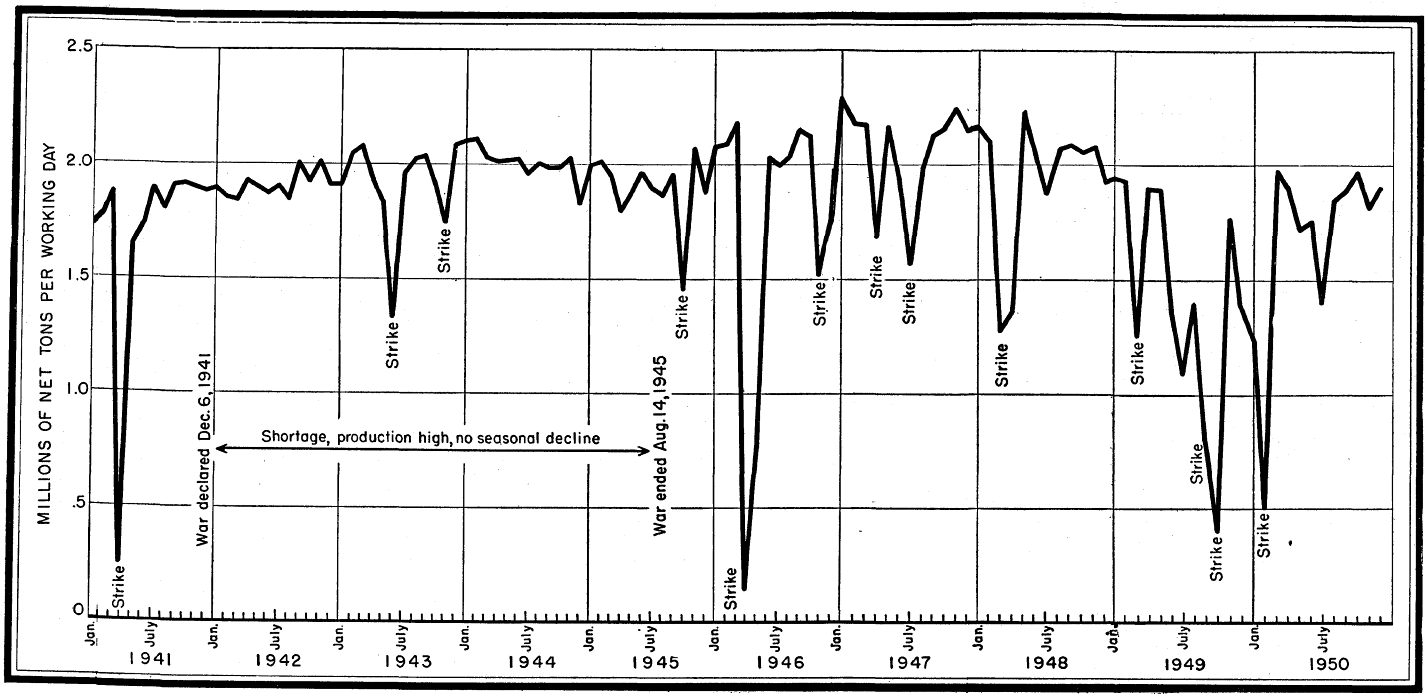

Figure 5.—Average production of bituminous coal and lignite in the United States per working day in each month, 1941–50.

TABLE 13.—Bituminous-coal and lignite production, by methods of mining and loading and average output per man per day, in the United States, by States, in 1949

State	Mined underground				Mined by stripping		Total	
	Hand-loaded (net tons)	Mechanically loaded (net tons)	Total (net tons)	Average tons per man per day	Net tons	Average tons per man per day	Net tons	Average tons per man per day
Alabama	3,660,429	7,488,446	11,148,875	3.55	1,784,955	8.95	12,933,830	3.87
Alaska	335,867	------	335,867	5.19	97,666	5.48	433,533	5.26
Arizona	4,850	------	4,850	2.27	------	------	4,850	2.27
Arkansas	98,037	638,326	736,363	2.96	225,148	7.68	961,511	3.46
California (lignite)	------	------	------	------	3,900	8.33	3,900	8.33
Colorado	1,396,114	2,928,841	4,324,955	5.19	311,477	12.52	4,636,432	5.40
Idaho	3,219	------	3,219	1.49	------	------	3,219	1.49
Illinois	2,881,432	30,433,947	33,315,379	7.26	13,892,580	18.10	47,207,959	8.81
Indiana	402,550	6,554,884	6,957,434	7.47	9,592,322	15.46	16,549,756	10.67
Iowa	705,378	49,433	754,811	3.17	969,673	10.22	1,724,484	5.18
Kansas	131,005	------	131,005	2.51	1,900,112	13.52	2,031,117	10.54
Kentucky	28,970,684	23,252,668	52,223,352	5.50	10,359,912	20.96	62,583,264	6.26
Maryland	335,332	240,982	576,314	3.60	92,018	11.14	668,332	3.97
Michigan	11,450	------	11,450	2.34	------	------	11,450	2.34
Missouri	334,671	------	334,671	2.55	3,312,785	16.01	3,647,456	10.78
Montana:								
Bituminous	62,038	839,555	901,593	6.88	1,819,342	79.33	2,720,935	17.68
Lignite	31,615	8,756	40,371	5.97	4,697	10.82	45,068	6.27
Total Montana	93,653	848,311	941,964	6.84	1,824,039	78.05	2,766,003	17.17
New Mexico	215,278	788,756	1,004,034	4.94	------	------	1,004,034	4.94
North Dakota (lignite)	28,791	441,556	470,347	10.18	2,496,913	23.68	2,967,260	19.57
Ohio	2,829,995	9,807,877	12,637,872	5.93	18,322,665	16.31	30,960,537	9.51
Oklahoma	238,515	726,896	965,411	3.52	2,056,448	12.53	3,021,859	6.90
Pennsylvania	27,307,482	39,676,493	66,983,975	4.80	22,230,628	12.33	89,214,603	5.67
South Dakota (lignite)	------	------	------	------	26,429	6.23	26,429	6.23
Tennessee	1,893,564	1,801,159	3,694,723	4.00	477,549	8.59	4,172,272	4.26
Texas (lignite)	------	------	------	------	49,473	13.90	49,473	13.90
Utah	174,924	5,984,668	6,159,592	6.57	------	------	6,159,592	6.57
Virginia	7,074,765	6,435,665	13,510,430	4.83	1,073,657	14.87	14,584,087	5.08
Washington	249,079	528,234	777,313	3.60	121,733	8.04	899,046	3.89
West Virginia	29,972,275	78,891,746	108,864,021	5.73	13,746,557	15.45	122,610,578	6.17
Wyoming	67,270	4,856,994	4,924,264	7.22	1,076,660	20.30	6,000,924	8.17
Other States: Georgia and North Carolina	30,246	------	30,246	1.17	------	------	30,246	1.17
Total 1949	109,446,855	222,375,882	331,822,737	5.42	106,045,299	15.33	437,868,036	6.43

METHOD OF MINING [6]

TABLE 14.—Growth of strip mining at bituminous-coal and lignite mines in the United States, 1914–49

Year	Production (thousand net tons)			Percent of total mined by stripping	Average tons per man per day			Average value per ton, f. o. b. mine			Number of strip mines	Number of power shovels and draglines
	Underground mines	Strip mines	Total		Underground mines [1]	Strip mines [2]	Total	Underground mines [1]	Strip mines [2]	Total		
1914	421,423	1,281	422,704	0.3	3.71	5.06	3.71	(3)	(3)	$1.17	[4] 35	48
1915	439,792	2,832	442,624	.6	3.90	5.81	3.91	$1.13	$1.18	1.13	[4] 60	87
1916	498,587	3,933	502,520	.8	3.88	6.67	3.90	1.32	1.51	1.32	[4] 79	111
1917	546,001	5,790	551,791	1.0	3.75	6.52	3.77	2.26	2.34	2.26	[4] 126	182
1918	571,098	8,288	579,386	1.4	3.76	6.81	3.78	2.58	2.54	2.58	[4] 165	276
1919	460,225	5,635	465,860	1.2	3.82	6.21	3.84	2.49	2.33	2.49	[4] 168	287
1920	559,807	8,860	568,667	1.5	3.97	7.20	4.00	3.74	4.12	3.75	[4] 174	312
1921	410,865	5,057	415,922	1.2	4.18	8.28	4.20	2.89	2.87	2.89	[4] 155	279
1922	412,059	10,209	422,268	2.4	4.24	8.09	4.28	3.02	3.07	3.02	272	379
1923	552,625	11,940	564,565	2.1	4.43	9.32	4.47	2.69	2.31	2.68	263	442
1924	470,080	13,607	483,687	2.8	4.50	9.91	4.56	2.20	2.00	2.20	234	420
1925	503,182	16,871	520,053	3.2	4.45	11.18	4.52	2.05	1.84	2.04	227	389
1926	556,444	16,923	573,367	3.0	4.42	11.13	4.50	2.07	1.89	2.06	237	410
1927	499,385	18,378	517,763	3.6	4.47	11.06	4.55	1.99	1.90	1.99	255	455
1928	480,956	19,789	500,745	4.0	4.61	13.02	4.73	1.87	1.69	1.86	250	415
1929	514,721	20,268	534,989	3.8	4.73	14.08	4.85	1.79	1.57	1.78	200	411
1930	447,684	19,842	467,526	4.3	4.93	16.21	5.06	1.71	1.54	1.70	218	341
1931	363,157	18,932	382,089	5.0	5.12	17.68	5.30	1.54	1.51	1.54	235	314
1932	290,069	19,641	309,710	6.3	4.99	16.95	5.22	1.31	1.32	1.31	255	332
1933	315,360	18,270	333,630	5.5	4.60	13.59	4.78	1.34	1.33	1.34	289	389
1934	338,578	20,790	359,368	5.8	4.23	13.28	4.40	1.76	1.49	1.75	344	458
1935	348,726	23,647	372,373	6.4	4.32	12.01	4.50	1.79	1.47	1.77	368	507
1936	410,962	28,126	439,088	6.4	4.42	13.91	4.62	1.77	1.49	1.76	381	562
1937	413,780	31,751	445,531	7.1	(3)	(3)	4.69	(3)	(3)	1.94	449	(3)
1938	318,138	30,407	348,545	8.7	4.60	15.00	4.89	(3)	(3)	1.95	465	737
1939	357,133	37,722	394,855	9.6	4.92	14.68	5.25	1.88	1.49	1.84	537	914
1940	417,604	43,167	460,771	9.4	4.86	15.63	5.09	1.94	1.56	1.91	638	1,071
1941	459,078	55,071	514,149	10.7	4.83	15.59	5.20	2.23	1.79	2.19	769	1,321
1942	515,490	67,203	582,693	11.5	4.74	15.52	5.12	2.41	1.90	2.36	834	1,438
1943	510,492	79,685	590,177	13.5	4.89	15.15	5.38	2.75	2.28	2.69	1,004	1,839
1944	518,678	100,898	619,576	16.3	5.04	15.89	5.67	3.01	2.48	2.92	1,240	2,312

1945	467,630	109,987	577,617	19.0	5.04	15.46	5.78	3.16	2.65	3.06	1,370	2,439
1946	420,958	112,964	533,922	21.1	5.43	15.73	6.30	3.59	2.87	3.44	1,445	2,744
1947	491,229	139,395	630,624	22.1	5.49	15.93	6.42	4.35	3.47	4.16	1,750	3,254
1948	460,012	139,506	599,518	23.3	5.31	15.28	6.26	5.26	4.11	4.99	1,971	3,712
1949	331,823	106,045	437,868	24.2	5.42	15.33	6.43	5.18	3.94	4.88	1,761	3,576

[1] Computed by deducting "Strip mines" data from "Total."
[2] Includes power strip pits proper and excludes horse stripping operations and mines combining stripping and underground in the same operation for the years 1914–42, inclusive. The years 1943–49, inclusive, include data on all strip mines.
[3] Data not available.
[4] Exclusive of horse stripping operations.

[5] See also tables 12, 42, 46, and 47 and figure 4.

TABLE 15.—Bituminous coal and lignite mined by different methods in the United States, by States, in 1949

State	From underground workings							From strip pits		Grand total production (net tons)
	Cut by hand		Shot from solid		Cut by machines		Total underground (net tons)	Net tons	Percent of grand total	
	Net tons	Percent of total underground	Net tons	Percent of total underground	Net tons	Percent of total underground				
Alabama	100,339	0.9	2,345,571	21.0	8,702,965	78.1	11,148,875	1,784,955	13.8	12,933,830
Alaska	-----	-----	335,867	100.0	-----	-----	335,867	97,666	22.5	433,533
Arizona	-----	-----	4,850	100.0	-----	-----	4,850	-----	-----	4,850
Arkansas	8,038	1.1	40,044	5.4	688,281	93.5	736,363	225,148	23.4	961,511
California (lignite)	-----	-----	-----	-----	-----	-----	-----	3,900	-----	3,900
Colorado	639,037	14.8	106,726	2.4	3,579,192	82.8	4,324,955	311,477	6.7	4,636,432
Idaho	-----	-----	3,219	100.0	-----	-----	3,219	-----	-----	3,219
Illinois	15,034	(1)	566,081	1.7	32,734,264	98.3	33,315,379	13,892,580	29.4	47,207,959
Indiana	3,859	.1	105,709	1.5	6,847,866	98.4	6,957,434	9,592,322	58.0	16,549,756
Iowa	20,570	2.7	372,389	49.4	361,852	47.9	754,811	969,673	56.2	1,724,484
Kansas	-----	-----	30,921	23.6	100,084	76.4	131,005	1,900,112	93.6	2,031,117
Kentucky	300,946	.6	11,623,826	22.2	40,298,580	77.2	52,223,352	10,359,912	16.6	62,583,264
Maryland	141,101	24.5	85,295	14.8	349,918	60.7	576,314	92,018	13.8	668,332
Michigan	-----	-----	-----	-----	11,450	100.0	11,450	-----	-----	11,450
Missouri	42,744	12.8	2,791	.8	289,136	86.4	334,671	3,312,785	90.8	3,647,456
Montana:										
Bituminous	-----	-----	4,781	.5	896,812	99.5	901,593	1,819,342	66.9	2,720,935
Lignite	-----	-----	40,371	100.0	-----	-----	40,371	4,697	10.4	45,068
Total Montana	-----	-----	45,152	4.8	896,812	95.2	941,964	1,824,039	65.9	2,766,003
New Mexico	11,530	1.1	103,062	10.3	889,442	88.6	1,004,034	-----	-----	1,004,034
North Dakota (lignite)	-----	-----	24,885	5.3	445,462	94.7	470,347	2,496,913	84.1	2,967,260
Ohio	48,233	.4	37,338	.3	12,552,301	99.3	12,637,872	18,322,665	59.2	30,960,537
Oklahoma	11,941	1.3	54,389	5.6	899,081	93.1	965,411	2,056,448	68.1	3,021,859
Pennsylvania	4,204,708	6.3	1,116,559	1.6	61,662,708	92.1	66,983,975	22,230,628	24.9	89,214,603
South Dakota (lignite)	-----	-----	-----	-----	-----	-----	-----	26,429	100.0	26,429
Tennessee	121,746	3.3	347,876	9.4	3,225,101	87.3	3,694,723	477,549	11.4	4,172,272
Texas (lignite)	-----	-----	-----	-----	-----	-----	-----	49,473	100.0	49,473
Utah	6,856	.1	62,782	1.0	6,089,954	98.9	6,159,592	-----	-----	6,159,592
Virginia	65,968	.5	695,442	5.1	12,749,020	94.4	13,510,430	1,073,657	7.4	14,584,087
Washington	101,850	13.1	254,679	32.8	420,784	54.1	777,313	121,733	13.5	899,046
West Virginia	1,226,326	1.1	2,962,075	2.7	104,675,620	96.2	108,864,021	13,746,557	11.2	122,610,578
Wyoming	2,111	.1	21,088	.4	4,901,065	99.5	4,924,264	1,076,660	17.9	6,000,924
Other States: Georgia and North Carolina	-----	-----	16,600	54.9	13,646	45.1	30,246	-----	-----	30,246
Total 1949	7,072,937	2.1	21,365,216	6.5	303,384,584	91.4	331,822,737	106,045,299	24.2	437,868,036

TABLE 16.—Number of coal-cutting machines in bituminous-coal and lignite mines, average output per machine, and percentage of total product of underground mines cut by machines in the United States, by States, in 1948–49

State	1948			1949		
	Number of coal-cutting machines in use	Average output per machine (net tons)	Percent of total product of underground mines cut by machines	Number of coal-cutting machines in use	Average output per machine (net tons)	Percent of total product of underground mines cut by machines
Alabama	659	19, 809	77. 4	590	14, 751	78. 1
Arkansas	93	11, 173	92. 5	87	7, 911	93. 5
Colorado	521	8, 294	81. 3	491	7, 290	82. 8
Illinois	723	64, 371	97. 4	721	45, 401	98. 3
Indiana	243	40, 040	97. 7	228	30, 035	98. 4
Iowa	56	7, 428	47. 2	57	6, 348	47. 9
Kansas	22	5, 911	80. 3	21	4, 766	76. 4
Kentucky	1, 987	27, 106	77. 3	1, 975	20, 404	77. 2
Maryland	55	9, 940	44. 9	66	5, 302	60. 7
Michigan	2	6, 510	100. 0	2	5, 725	100. 0
Missouri	46	6, 308	82. 6	44	6, 571	86. 4
Montana (bituminous)	36	26, 266	95. 9	36	24, 911	95. 2
New Mexico	57	21, 521	89. 9	58	15, 335	88. 6
North Dakota (lignite)	6	76, 966	95. 2	8	55, 683	94. 7
Ohio	822	22, 261	99. 4	757	16, 582	99. 3
Oklahoma	76	13, 593	91. 4	117	7, 684	93. 1
Pennsylvania	3, 529	25, 280	90. 3	3, 383	18, 227	92. 1
Tennessee	254	18, 632	84. 4	266	12, 124	87. 3
Utah	214	31, 454	98. 8	242	25, 165	98. 9
Virginia	461	33, 616	93. 4	545	23, 393	94. 4
Washington	45	11, 281	52. 9	46	9, 147	54. 1
West Virginia	4, 198	34, 188	95. 7	4, 380	23, 899	96. 2
Wyoming	340	15, 671	99. 5	302	16, 229	99. 5
Other States: Georgia and North Carolina				2	6, 823	45. 1
Total	14, 445	28, 898	90. 7	14, 424	21, 033	91. 4

TABLE 17.—Number of underground bituminous-coal and lignite mines using power drills for shot holes in 1948–49 and summary of operations, by States, in 1949

State	Number of mines using power drills		1949					
			Number of power drills		Net tons produced in working places where shot holes were power-drilled			Total production from mines using power drills (net tons)
	1948	1949	Electric	Compressed air	Electric drills	Compressed air drills	Total	
Alabama	78	84	817	67	8,819,340	9,873	8,829,213	9,375,627
Alaska	2	2	20	15	151,914	182,845	334,759	334,759
Arkansas	17	20	33	38	229,708	49,473	279,181	637,603
Colorado	98	101	438	48	3,145,252	5,240	3,150,492	3,902,040
Idaho	------	1	3	------	3,219	------	3,219	3,219
Illinois	159	150	1,251	8	31,943,492	5,226	31,948,718	32,161,482
Indiana	38	35	296	2	6,750,399	------	6,750,399	6,750,399
Iowa	13	27	65	------	391,942	------	391,942	418,671
Kansas	1	2	1	3	8,823	------	8,823	15,597
Kentucky	1,027	931	2,494	123	36,664,052	------	36,664,052	39,519,925
Maryland	5	8	44	3	225,977	------	225,977	328,411
Michigan	1	1	2	------	5,000	------	5,000	11,450
Missouri	7	9	14	------	175,879	------	175,879	175,879
Montana:								
Bituminous	11	12	44	1	883,907	------	883,907	883,907
Lignite	3	5	13	------	34,356	------	34,356	34,356
Total Montana	14	17	57	1	918,263	------	918,263	918,263
New Mexico	5	6	48	5	806,686	------	806,686	812,039
North Dakota (lignite)	5	5	13	------	449,677	------	449,677	453,112
Ohio	174	183	642	3	10,774,568	------	10,774,568	11,369,227
Oklahoma	6	10	88	4	674,126	1,867	675,993	725,510
Pennsylvania	372	376	2,386	497	45,076,132	563,763	45,639,895	56,745,759
Tennessee	42	46	230	29	2,743,052	------	2,743,052	3,216,038
Utah	39	58	302	7	6,100,756	8,000	6,108,756	6,119,564
Virginia	152	270	504	49	9,174,756	4,669	9,179,425	11,838,284
Washington	23	20	78	139	207,601	550,912	758,513	758,513
West Virginia	491	533	3,850	365	79,597,522	------	79,597,522	92,787,297
Wyoming	29	25	411	2	4,902,473	2,136	4,904,609	4,904,609
Other States: Georgia and North Carolina	------	3	------	3	------	4,000	4,000	4,000
Total	2,798	2,923	14,087	1,411	249,940,609	1,388,004	251,328,613	284,287,277

TABLE 18.—Number of underground bituminous-coal mines and number of haulage units in use, in the United States, in selected years [1]

Units	1924	1946	1948	1949
Underground mines	7,352	5,888	7,108	6,798
Locomotives:				
Trolley	[2] 12,765	14,110	14,617	[3] 14,090
Battery	1,515	1,011	904	[3] 928
Other types	443	110	74	[3] 59
Total	14,723	15,231	15,595	[3] 15,077
Rope haulage units:				
Portable	(4)	4,084	3,886	3,904
Stationary	(4)	1,009	1,044	1,073
Total	649	5,093	4,930	4,977
Shuttle cars:				
Cable reel	(4)	(4)	(4)	2,144
Battery	(4)	(4)	(4)	623
Total	(4)	(4)	(4)	2,767
Mother conveyors	(4)	457	755	860
Animals	36,352	10,185	10,834	10,313

[1] Exclusive of lignite and Virginia semianthracite mines in 1946, 1948, and 1949. Detailed data, by States, ublished in Bureau of Mines Weekly Coal Report 1742, February 1, 1951.
[2] Includes combination trolley and battery locomotives.
[3] Revised.
[4] Data not available.

TABLE 19.—**Stripping operations in the bituminous-coal and lignite fields of the United States, by States and counties, in 1949** [1]

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Alabama:												
Bibb	1			1		9,841	8		8	130	1,040	9.46
Blount	4	1	1	5		195,942	101	36	137	219	30,011	6.53
Cullman	2			2		8,885	8		8	186	1,485	5.98
Etowah	1			2		13,393	7	1	8	300	2,400	5.58
Jefferson	9		3	19	2	578,146	307	139	446	161	71,690	8.06
St. Clair	2			1		24,209	15	4	19	173	3,285	7.37
Tuscaloosa	8			20	1	411,093	152	49	201	193	38,818	10.59
Walker	22		3	37	1	543,446	287	108	395	128	50,655	10.73
Total Alabama	49	1	7	87	4	1,784,955	885	337	1,222	163	199,384	8.95
Alaska	4			4	2	97,666	77	33	110	162	17,812	5.48
Arkansas:												
Franklin	2	1		2		23,641	31	8	39	130	5,084	4.65
Johnson	4		1	6		82,349	74	46	120	75	9,056	9.09
Logan	1	1				2,500	8		8	40	320	7.81
Sebastian	4	2	1	8	1	116,658	98	27	125	119	14,865	7.85
Total Arkansas	11	4	2	16	1	225,148	211	81	292	100	29,325	7.68
California: Lignite	1			1		3,900	3		3	156	468	8.33
Colorado:												
El Paso	1					4,540	5		5	189	945	4.80
Fremont	1				1	5,979	4		4	98	392	15.25
Huerfano	1			1		31,342	15	6	21	138	2,898	10.82
Jackson	2				1	8,538	9	1	10	114	1,140	7.49
Routt	4		1	4		246,286	86	61	147	125	18,432	13.36
Weld	1			1		14,792	18		18	60	1,080	13.70
Total Colorado	10		1	6	2	311,477	137	68	205	121	24,887	12.52
Illinois:												
Bureau	2		5	1	1	559,585	64	110	174	191	33,313	16.80
Fulton	12		23	9	3	3,893,146	418	579	997	179	178,843	21.77
Grundy and Will	4		15	3	1	1,200,465	276	249	525	156	87,934	14.65
Hancock	1			3	2	53,727	18	8	26	156	4,056	13.25
Jackson	6		5	2		364,019	113	51	164	139	22,786	15.98
Knox	3		9			1,515,063	157	268	425	183	77,691	19.50
La Salle	6		2	1		54,573	41	16	57	89	5,079	10.74
Livingston	1				1	6,766	6		6	101	606	11.17

Morgan	1					4,204	6		6	138	828	5.08
Peoria	7			3		28,096	54		54	56	3,000	9.37
Perry	4		14	2	2	2,186,335	424	369	793	191	151,131	14.47
Randolph	1		4	2		857,504	60	85	145	199	28,788	29.79
St. Clair	4		8	3	3	1,300,356	164	126	290	209	60,754	21.40
Saline	2		3	4		531,273	121	134	255	194	49,467	10.74
Schuyler	3		1			26,082	25	22	47	51	2,399	10.87
Vermilion	7		2	5	2	506,284	95	35	130	179	23,234	21.79
Williamson	8		5	9	1	805,102	167	87	254	149	37,729	21.34
Total Illinois	72		96	47	16	13,892,580	2,209	2,139	4,348	177	767,638	18.10
Indiana:												
Clay	11	1	11	13	12	1,149,358	322	195	517	173	89,683	12.82
Daviess	1		2	1		328,633	45	48	93	161	14,968	21.96
Fountain	1			1	1	69,188	20	10	30	176	5,280	13.10
Gibson	1			1		12,250	25		25	30	750	16.33
Greene	5		2	7	1	655,088	143	94	237	161	38,213	17.14
Knox	1		4	1		495,742	137	97	234	160	37,428	13.25
Owen	2		2		2	126,084	34	7	41	228	9,355	13.48
Parke	2			5	1	50,856	41	7	48	108	5,205	9.77
Pike	7		18	14	1	2,603,867	584	304	888	189	168,095	15.49
Spencer	2			5	1	152,768	80	16	96	146	14,020	10.90
Sullivan	5		9	1	1	961,781	194	147	341	171	58,220	16.52
Vermillion	3		5	4		411,119	95	55	150	197	29,533	13.92
Vigo	3		3	2	2	556,546	148	54	202	206	41,519	13.40
Warrick	4		18	5	2	2,019,042	365	268	633	171	108,188	18.66
Total Indiana	48	1	74	60	24	9,592,322	2,233	1,302	3,535	176	620,457	15.46
Iowa:												
Davis	2			2	1	16,525	11		11	219	2,410	6.86
Mahaska	11			10	8	182,847	88	25	113	231	26,097	7.01
Marion	22		2	17	17	658,778	206	83	289	186	53,715	12.26
Van Buren	3			5	2	44,951	22	14	36	140	5,040	8.92
Wapello	5			5	4	66,572	31	15	46	166	7,620	8.74
Total Iowa	43		2	39	32	969,673	358	137	495	192	94,882	10.22
Kansas:												
Bourbon	6	1	2			139,054	71	26	97	132	12,757	10.90
Cherokee	10	1	2	5	4	707,922	163	107	270	201	54,393	13.01
Coffey	1				1	2,000	4		4	120	480	4.17
Crawford	10	5	9	2	3	766,047	199	113	312	193	60,122	12.74
Labette	1				1	1,686	3		3	191	573	2.94
Linn	2		2			280,288	24	25	49	231	11,337	24.72
Osage	2				1	3,115	10		10	84	842	3.70
Total Kansas	32	7	15	7	10	1,900,112	474	271	745	189	140,504	13.52

See footnote at end of table.

TABLE 19.—Stripping operations in the bituminous-coal and lignite fields of the United States, by States and counties, in 1949 [1]—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Kentucky:												
Bell	1					2,800	6		6	50	300	9.33
Boyd	3			5		210,631	60	13	73	194	14,132	14.90
Breathitt, Elliott, and Perry	3	1	1	6		293,765	113	14	127	127	16,097	18.25
Butler	2			1		6,765	8	2	10	146	1,464	4.62
Clay	8			3		75,200	34	9	43	145	6,227	12.08
Daviess	5			7		278,248	38	28	66	210	13,870	20.06
Edmonson	1			1		5,000	5		5	100	500	10.00
Grayson	2			3	1	32,251	32	12	44	140	6,153	5.24
Hancock	2			3		186,875	34	22	56	226	12,639	14.79
Hopkins	24		13	45	5	6,266,537	655	551	1,206	204	245,737	25.50
Jackson	2			1		4,996	11		11	67	734	6.81
Knott	1			1		12,240	8	2	10	230	2,300	5.32
Knox	1			1		14,814	9	3	12	150	1,800	8.23
Laurel	2					4,972	7		7	107	750	6.63
Leslie	3			6	1	103,580	30	7	37	189	6,993	14.81
Letcher	3			8	1	185,317	73	14	87	162	14,109	13.13
McCreary	2			1		94,029	62	13	75	165	12,351	7.61
McLean	1			1		6,500	3		3	200	600	10.83
Morgan	3			2		16,362	15	5	20	105	2,100	7.79
Muhlenberg	6		6	11	5	888,376	248	119	367	139	50,963	17.43
Ohio	9		7	14	1	1,372,435	210	187	397	145	57,699	23.79
Rockcastle	4			4		76,037	29	11	40	189	7,560	10.06
Webster	2			4		106,125	33	13	46	103	4,755	22.32
Whitley	4			8		45,600	34	7	41	166	6,810	6.70
Wolfe	5			2		70,457	39	12	51	150	7,663	9.19
Total Kentucky	99	1	27	138	14	10,359,912	1,796	1,044	2,840	174	494,306	20.96
Maryland:												
Allegany	4			1	3	23,615	26	4	30	97	2,915	8.10
Garrett	3			4		68,403	42	10	52	103	5,346	12.80
Total Maryland	7			5	3	92,018	68	14	82	101	8,261	11.14
Missouri:												
Barton	4		4			284,919	52	37	89	218	19,396	14.69
Bates	4		3			753,690	69	71	140	224	31,334	24.05
Boone	2			2		55,117	17	4	21	257	5,388	10.23
Callaway	4			3	2	134,553	48	15	63	258	16,234	8.29

Dade	1				1	1,378	3		3	200	600	2.30
Henry	13		6	2		540,970	122	53	175	235	41,129	13.15
Jasper	1	1				2,329	5		5	190	950	2.45
Johnson	1		1	1		131,574	25	18	43	214	9,199	14.30
Macon	2		4		1	792,011	62	101	163	260	42,343	18.70
Monroe	1				1	4,208	6	2	8	201	1,608	2.62
Ralls	1			1		6,771	12		12	171	2,052	3.30
Randolph	1		4			426,283	37	40	77	236	18,177	23.45
St. Clair	2			1	1	30,058	21	7	28	151	4,233	7.10
Vernon	6	2	4	2	1	148,924	68	28	96	149	14,298	10.42
Total Missouri	43	3	26	12	7	3,312,785	547	376	923	224	206,941	16.01
Montana:												
Bituminous coal: Rosebud	1		6	1		1,819,342	68	19	87	264	22,935	79.33
Lignite	1				1	4,697	6	1	7	62	434	10.82
Total Montana	2		6	1	1	1,824,039	74	20	94	249	23,369	78.05
North Dakota: Lignite	34		16	13	18	2,496,913	260	195	455	232	105,452	23.68
Ohio:												
Athens	8			14	1	259,767	147	103	250	90	22,552	11.52
Belmont	20			41	6	1,132,842	285	107	392	149	58,397	19.40
Carroll	8			13	7	303,182	116	30	146	213	31,036	9.77
Columbiana	38			57	5	1,136,900	332	77	409	221	90,281	12.59
Coshocton	18			23	11	643,827	178	53	231	226	52,246	12.32
Gallia	4			7	1	173,021	98	24	122	122	14,873	11.63
Guernsey	5			16		316,050	183	31	214	137	29,404	10.75
Harrison	14		17	29	4	4,114,797	428	541	969	165	160,244	25.68
Hocking	2			2	2	15,442	12	3	15	159	2,389	6.46
Holmes	1			1		1,819	4		4	76	304	5.98
Jackson	10			6		131,161	64	7	71	204	14,515	9.04
Jefferson	33	4	6	61	7	2,818,231	567	291	858	192	164,960	17.08
Lawrence	3			3		44,555	17	4	21	160	3,354	13.28
Mahoning	12			20	5	552,922	126	36	162	243	39,322	14.06
Meigs	5			8	1	133,352	72	17	89	115	10,194	13.08
Morgan	4			4	1	40,444	56	8	64	78	5,007	8.08
Muskingum	13		3	13	10	1,317,587	169	69	238	183	43,445	30.33
Noble	8		4	23		1,178,383	183	90	273	221	60,239	19.56
Perry	22		5	46	8	1,674,831	444	265	709	166	117,533	14.25
Portage	2			2		108,788	23	9	32	281	8,985	12.15
Scioto	1					6,426	3		3	234	702	9.11
Stark	15			29	12	716,788	194	42	236	235	55,513	12.91
Tuscarawas	24	2	2	30	18	824,849	256	87	343	223	76,598	10.77
Vinton	9			10	2	379,122	123	56	179	239	42,717	8.88
Washington	2			5		168,704	36	14	50	192	9,598	17.58
Wayne	1			4	1	128,875	21	10	31	295	9,145	14.09
Total Ohio	282	6	37	467	102	18,322,665	4,137	1,974	6,111	184	1,123,553	16.31

See footnote at end of table.

TABLE 19.—Stripping operations in the bituminous-coal and lignite fields of the United States, by States and counties, in 1949 [1]—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
Oklahoma:												
Coal	2		2	3		128,419	41	16	57	251	14,332	8.96
Craig	3	1		2		34,462	24	9	33	95	3,122	11.04
Haskell	5	1		7		163,896	80	9	89	184	16,361	10.02
Latimer	1		2			76,069	34	24	58	72	4,196	18.13
LeFlore	8		1	8	3	495,306	158	59	217	158	34,377	14.41
Muskogee	1	3		1		184,935	44	11	55	298	16,364	11.30
Okmulgee	2		2	2		374,794	38	40	78	194	15,162	24.72
Pittsburg	1			2		5,507	16	2	18	36	648	8.50
Rogers	3	5	3	2		559,635	153	73	226	250	56,570	9.89
Sequoyah	1			1		29,975	15	5	20	123	2,460	12.18
Tulsa	1					1,400	4		4	50	200	7.00
Wagoner	1					2,050	5		5	77	385	5.32
Total Oklahoma	29	10	10	28	3	2,056,448	612	248	860	191	164,177	12.53
Pennsylvania:												
Allegheny	83			105	28	2,547,356	863	264	1,127	161	181,803	14.01
Armstrong	29			60	10	1,148,169	486	145	631	135	85,056	13.50
Beaver	6			13	2	389,403	92	35	127	236	29,970	12.99
Bedford	2			6		105,759	73	6	79	121	9,558	11.06
Blair	5		1	9	1	274,236	88	27	115	145	16,703	16.42
Bradford	1			1		7,355	3		3	290	870	8.45
Butler	22	1	1	44	16	1,167,383	339	105	444	199	88,478	13.19
Cambria	33			67	13	942,527	514	110	624	117	72,738	12.96
Cameron	2			2	2	51,698	28	5	33	193	6,370	8.12
Centre	20			35	7	648,004	272	69	341	176	60,134	10.78
Clarion	42		1	82	18	2,287,230	733	268	1,001	185	184,856	12.37
Clearfield	105	8		220	32	3,691,297	1,608	452	2,060	160	329,549	11.20
Clinton	10	2		16	2	394,575	188	34	222	147	32,626	12.09
Elk	18			28	3	489,415	233	67	300	159	47,838	10.23
Fayette	41			28	16	485,141	289	41	330	117	38,559	12.58
Fulton and Huntingdon	4			15		251,295	135	17	152	153	23,272	10.80
Greene	8			16	2	270,546	116	28	144	161	23,139	11.69
Indiana	46	2	1	91	3	1,292,673	565	125	690	177	122,048	10.59
Jefferson	32	1		44	11	824,906	424	125	549	126	68,956	11.96
Lawrence	6			9	3	197,088	56	10	66	221	14,586	13.51
Lycoming	1			1		7,560	8		8	135	1,080	7.00
McKean	2			3		23,960	16	3	19	118	2,245	10.67
Mercer	5			10	3	314,474	66	27	93	219	20,379	15.43

Somerset	41		1	70	11	1, 189, 869	608	198	806	124	99, 743	11. 93
Tioga	3			4		64, 098	26	15	41	112	4, 602	13. 93
Venango	5			15	3	273. 338	57	14	71	248	17, 642	15. 49
Washington	38	2	6	64	7	2, 062, 997	749	250	999	153	153, 222	13. 46
Westmoreland	54			60	20	828, 276	473	88	561	118	66, 422	12. 47
Total Pennsylvania	664	16	11	1, 118	213	22, 230, 628	9, 108	2, 528	11, 636	155	1, 802, 444	12. 33
South Dakota: Lignite	2			1	1	26, 429	15	2	17	250	4, 245	6. 23
Tennessee:												
Campbell	2		2	2	3	127, 560	50	37	87	192	16, 708	7. 63
Claiborne	4			8		89, 927	52	11	63	152	9, 590	9. 38
Cumberland	1			1		12. 763	12	3	15	100	1, 500	8. 51
Grundy	1		1	3		64, 804	22	8	30	192	5, 760	11. 25
Marion	1			5	4	44, 700	40	10	50	110	5, 500	8. 13
Morgan	3			4		62. 411	23	4	27	186	5, 012	12. 45
Overton	1			3		9, 496	5		5	190	950	10. 00
Scott	1			1		10, 162	10		10	126	1, 260	8. 07
Sequatchie	2			2	1	47, 762	39	4	43	149	6, 404	7. 46
Van Buren	1			3	1	7, 964	22		22	131	2, 883	2. 76
Total Tennessee	17		3	32	9	477, 549	275	77	352	158	55, 567	8. 59
Texas: Lignite	1				1	49, 473	10	6	16	223	3, 560	13. 90
Virginia:												
Buchanan	7		3	20		650, 616	219	72	291	151	43, 866	14. 83
Russell	2			6		131, 915	34	11	45	167	7, 532	17. 51
Tazewell	1			1		13, 364	4		4	262	1, 047	12. 76
Wise	6			14		277, 762	83	32	115	172	19. 756	14. 06
Total Virginia	16		3	41		1, 073, 657	340	115	455	159	72, 201	14. 87
Washington:												
King	4		1	2	2	58, 051	32	17	49	150	7, 339	7. 91
Kittitas	1		1		1	37, 889	28	4	32	161	5, 152	7. 35
Thurston	1			1	1	25, 793	26	4	30	88	2, 650	9. 73
Total Washington	6		2	3	4	121, 733	86	25	111	136	15, 141	8. 04
West Virginia:												
Barbour	18		3	34	4	1, 249, 053	302	225	527	151	79, 702	15. 67
Boone	6			5	2	155, 149	137	14	151	82	12, 411	12. 50
Braxton	2		4	1	1	130, 283	22	10	32	250	8, 008	16. 27
Brooke	13			17	3	638, 692	269	72	341	128	43, 554	14. 66
Fayette	23			46	6	1, 340, 459	507	125	632	137	86, 297	15. 53
Grant	1				1	7, 589	6		6	111	666	11. 39
Greenbrier	8			25	1	388, 642	174	40	214	151	32, 366	12. 01
Hancock	5			7	1	115, 149	45	7	52	144	7, 508	15. 34
Harrison	50			108	6	3, 327, 192	965	361	1, 326	132	174, 922	19. 02
Kanawha	8			11	2	301, 043	133	32	165	130	21, 373	14. 09

See footnote at end of table.

TABLE 19.—Stripping operations in the bituminous-coal and lignite fields of the United States, by States and counties, in 1949 [1]—Continued

State and county	Number of strip pits	Number of power shovels and dragline excavators				Mined by stripping (net tons)	Average number of men working daily			Average number of days worked	Number of man-days worked	Average tons per man per day
		Steam	Electric	Diesel	Gasoline		In strip pits	All others	Total			
West Virginia—continued												
Lewis	3			5		248,081	44	14	58	243	14,104	17.59
Logan	2		1	5		213,337	76	13	89	174	15,472	13.79
Marion	4			3	2	59,893	36	8	44	108	4,752	12.60
McDowell	16			35	1	870,827	453	99	552	132	72,986	11.93
Mercer	16		1	37	2	809,487	357	96	453	125	56,838	14.24
Mineral	4			2	1	34,259	18	4	22	101	2,231	15.36
Mingo	7			13	1	260,080	213	63	276	65	17,901	14.53
Monongalia	12			18		437,423	179	53	232	104	24,237	18.05
Nicholas	8			16	4	343,686	163	61	224	138	30,936	11.11
Preston	14			18	3	197,197	118	40	158	105	16,634	11.86
Putnam	1				1	5,676	12	6	18	20	360	15.77
Raleigh	16			23	7	469,851	306	62	368	111	40,855	11.50
Randolph	9			12	3	251,098	147	52	199	79	15,753	15.94
Taylor	8			20		473,148	136	40	176	149	26,141	18.10
Tucker	3			5		99,678	63	17	80	98	7,862	12.68
Upshur	11			21	3	669,248	125	63	188	167	31,445	21.28
Webster	2		2	3		139,886	32	7	39	238	9,282	15.07
Wyoming	8			20	1	510,451	153	50	203	173	35,205	14.50
Total West Virginia	278		11	510	56	13,746,557	5,191	1,634	6,825	130	889,801	15.45
Wyoming:												
Campbell	2		3			315,696	23	26	49	264	12,930	24.42
Carbon	3	1		3	1	306,264	49	27	76	202	15,358	19.94
Converse	2			1	1	11,307	8		8	175	1,403	8.06
Sheridan	4	1		6	2	443,393	81	32	113	207	23,357	18.98
Total Wyoming	11	2	3	10	4	1,076,660	161	85	246	216	53,048	20.30
Total United States 1949	1,761	51	352	2,646	527	106,045,299	29,267	12,711	41,978	165	6,917,423	15.33

[1] On returns from mines combining stripping and underground methods in same operation, tonnage has been separated and figures on employment prorated so that this table includes only data pertaining to strip mining.

MECHANICAL LOADING [7]

Bituminous coal and lignite mechanically loaded in underground mines amounted to 222,375,882 tons in 1949, or 67 percent of the total underground output.

Mechanical loading equipment used in underground bituminous-coal and lignite mines is divided into two types—devices that virtually eliminate hand shoveling (known as mobile loaders, scrapers, and self-loading conveyors) and those that greatly reduce the labor in hand shoveling (known as hand-loaded face conveyors and pit-car loaders). Devices in the first category are designated "machines" and those in the second category, "conveyors."

Several continuous miners were used in 1949. They are included with mobile loaders in the following tables.

Sales of Mechanical Loading Equipment.—Shipments of mechanical loading equipment for underground use in coal mines in the United States, in terms of capacity, were less in 1950 than in any year since 1935. Table 21 shows the reported sales of loading equipment to bituminous-coal and lignite operators, by type of equipment, and the number of manufacturers reporting for 1943–50.[8]

Table 22 compares loading equipment, "mother" conveyors, and shuttle cars in use in bituminous-coal and lignite mines in 1949, with sales in 1950, by States.

Extent of Mechanical Loading.—More than 79 percent of the underground tonnage mechanically loaded was handled by mobile loaders in 1949. Table 23 shows the tons and percentage handled by each type of equipment in 1948 and 1949.

During 1949, in underground bituminous-coal and lignite mines 4,205 mobile loaders handled 177,239,434 tons—an average of 42,150 tons per mobile loader per year; self-loading conveyors averaged 9,436; scrapers, 7,360; hand-loaded face conveyors, 7,131; and pit-car loaders, 3,171 per unit per year.

Mechanical Loading by States.—West Virginia has been the leading producer of mechanically loaded coal since 1939. During 1949 West Virginia produced 78,891,746 tons of mechanically loaded coal, followed by Pennsylvania with 39,676,493, Illinois with 30,433,947, Kentucky with 23,252,668, and Ohio with 9,807,877 tons. These five States produced 82 percent of the total output of underground, mechanically loaded bituminous coal in the United States in 1949.

Detailed data, by States, on the number of mines and machines and the production of coal mechanically loaded compared with the total production at mines using mechanical loading devices are given in table 25. Comparative changes in underground mechanical loading in 1948–49, by States, are shown in table 24.

Table 13 shows bituminous-coal and lignite tonnage mined by stripping, compared with underground hand-loaded and machine-loaded tonnage, as well as productivity at strip and underground mines, by States, for 1949.

[7] See also tables 12 and 13 and figure 4.

[8] Young, W. H., and Anderson, R. L., Sales of Mechanical Loading and Cleaning Equipment: Coal Age, February 1951, pp. 85-87; Min. Cong. Jour., February 1951, pp. 96-98; Mechanization, February 1951, pp. 96 98.

TABLE 20.—Units of mechanical loading equipment in use in underground bituminous-coal and lignite mines in the United States, 1944–1949

Type of equipment	1944	1945	1946	1947	1948	1949	Change from 1948 (percent)
Mobile loaders	2,737	2,950	3,200	3,569	[1] 3,980	[1] 4,205	+5.7
Scrapers	87	87	75	67	56	46	−17.9
Pit-car loaders	241	142	93	71	37	17	−54.1
Conveyors equipped with duckbills or other self-loading heads	1,331	1,383	1,521	1,531	1,632	1,483	−9.1
Hand-loaded conveyors	3,236	3,385	3,470	3,979	4,125	4,312	+4.5
Total	7,632	7,947	8,359	9,217	9,830	10,063	+2.4

[1] Includes continuous miners.

TABLE 21.—Units of mechanical loading equipment sold to bituminous-coal and lignite mines for underground use in the United States, as reported by manufacturers, 1943–50

Type of equipment	1943	1944	1945	1946	1947	1948	1949	1950	Change from 1949 (percent)
Mobile loaders	234	282	349	490	485	[1] 723	[1] 286	[1] 289	+1.0
Scrapers	13	20	6	3	12	17	8	1	−87.5
Conveyors [2]	798	580	738	838	846	1,025	394	316	−19.8
Pit-car loaders	1	--------	(3)	(3)	(3)	(3)	(3)	(3)	------------
Total	1,046	882	1,093	1,331	1,343	1,765	688	606	−11.9
Number of manufacturers reporting	24	22	25	24	23	22	22	20	------------

[1] Includes continuous miners.
[2] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.
[3] Canvass of sales of pit-car loaders discontinued in 1945.

TABLE 22.—Comparison of loading equipment, "mother" conveyors, and shuttle cars in use in bituminous-coal and lignite mines in the United States in 1949 with sales reported in 1950 by States

State	Mechanical loading equipment						"Mother" conveyors		Shuttle cars	
	Mobile loaders [1]		Scrapers		Conveyors [2]					
	In use 1949	Sales 1950	In use 1949	Sales 1950	In use 1949	Sales 1950	In use 1949 [3]	Sales 1950 [4]	In use 1949	Sales 1950
Alabama	147	13	21		431		22		129	7
Arkansas		1			75	2	11	1		
Colorado	38	2	1	1	307	1	3		39	5
Illinois	552	20			14	15	38	16	360	75
Indiana	167	5			5		3		103	15
Iowa	2				3		4			
Kentucky	450	55			669	51	143	24	503	94
Maryland					38	1	6			
Montana:										
Bituminous	31				8				3	
Lignite	2								3	
Total Montana	33				8				6	
New Mexico	21		4		1				11	
North Dakota	7								(5)	
Ohio	202	12			149	12	34	8	116	24
Oklahoma	4				122		10	4		7
Pennsylvania	989	76	4		932	73	143	29	479	111
Tennessee	28	2			214	4	13		34	
Utah	111	10	1		108		10	2	91	20
Virginia	132				204	4	27	4	76	2
Washington		1	7		91					
West Virginia	1,291	89			2,166	153	382	41	805	99
Wyoming	31	3	8		258		11	3	18	6
Total	4,205	289	46	1	5,795	316	860	132	2,770	465

[1] Includes continuous miners.
[2] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[3] Includes all belt conveyors, 500 feet and over in length, used for underground transportation of coal except main slope conveyors. Excludes lignite and Virginia semianthracite mines.
[4] Includes all haulage conveyors with capacity over 500 feet, except main slope conveyors.
[5] Data on number in use not available.

TABLE 23.—Bituminous coal and lignite mechanically loaded underground in the United States, by type of loading equipment, 1948–49

Type of equipment	1948		1949	
	Net tons	Percent of total	Net tons	Percent of total
Mobile loaders:				
Loading direct into mine cars	144,184,869	48.7	97,694,537	43.9
Loading onto conveyors	10,849,722	3.7	7,473,949	3.4
Loading into rubber-tired trucks	77,632,581	26.2	72,070,948	32.4
Scrapers	743,251	.3	338,545	.2
Pit-car loaders	183,931	.1	53,900	(1)
Conveyors equipped with duckbills or other self-loading heads	19,633,503	6.6	13,994,285	6.3
Hand-loaded conveyors	42,578,428	14.4	30,749,718	13.8
Total loaded mechanically	295,806,285	100.0	222,375,882	100.0

[1] Less than 0.5 percent.

TABLE 24.—Comparative changes in underground mechanical loading of bituminous coal and lignite by principal types of loading devices in the United States, by States, 1948–49

State	Net tons						Handled by each class (percent)				Underground output mechanically loaded (percent)	
	1948			1949			1948		1949			
	Loaded by machines [1]	Handled by conveyors [2]	Total	Loaded by machines [1]	Handled by conveyors [2]	Total	Loaded by machines [1]	Handled by conveyors [2]	Loaded by machines [1]	Handled by conveyors [2]	1948	1949
Alabama	7,929,533	2,967,426	10,896,959	5,544,898	1,943,548	7,488,446	72.8	27.2	74.0	26.0	64.6	67.2
Arkansas	80,000	817,126	897,126	13,411	624,915	638,326	8.9	91.1	2.1	97.9	79.9	86.7
Colorado	3,007,560	407,873	3,415,433	2,658,008	270,833	2,928,841	88.1	11.9	90.8	9.2	64.3	67.7
Illinois	42,874,637	167,779	43,042,416	30,380,047	53,900	30,433,947	99.6	.4	99.8	.2	90.1	91.4
Indiana	8,847,739		8,847,739	6,516,649	38,235	6,554,884	100.0		99.4	.6	88.9	94.2
Iowa	186,041	9,236	195,277	41,492	7,941	49,433	95.3	4.7	83.9	16.1	22.1	6.5
Kentucky	26,837,622	4,732,021	31,569,643	19,691,481	3,561,187	23,252,668	85.0	15.0	84.7	15.3	45.3	44.5
Maryland	114,940	172,451	287,391	38,099	202,883	240,982	40.0	60.0	15.8	84.2	23.6	41.8
Montana:												
Bituminous	882,950	10,000	892,950	827,555	12,000	839,555	98.9	1.1	98.6	1.4	94.0	93.1
Lignite	8,472		8,472	8,756		8,756	100.0		100.0		23.5	21.7
Total Montana	891,422	10,000	901,422	836,311	12,000	848,311	98.9	1.1	98.6	1.4	91.4	90.1
New Mexico	1,129,037		1,129,037	788,756		788,756	100.0		100.0		82.8	78.6
North Dakota (lignite)	460,781		460,781	441,556		441,556	100.0		100.0		95.0	93.9
Ohio	13,201,070	188,357	13,389,427	9,612,295	195,582	9,807,877	98.6	1.4	98.0	2.0	72.7	77.6
Oklahoma	114,176	394,138	508,314	34,605	692,291	726,896	22.5	77.5	4.8	95.2	45.0	75.3
Pennsylvania	46,321,056	7,177,441	53,498,497	34,321,543	5,354,950	39,676,493	86.6	13.4	86.5	13.5	54.2	59.2
Tennessee	1,582,994	1,446,674	3,029,668	990,386	810,773	1,801,159	52.2	47.8	55.0	45.0	54.0	48.7
Utah	6,515,901	72,993	6,588,894	5,873,574	111,094	5,984,668	98.9	1.1	98.1	1.9	96.7	97.2
Virginia	5,921,080	1,622,476	7,543,556	5,223,547	1,212,118	6,435,665	78.5	21.5	81.2	18.8	45.5	47.6
Washington	139,189	502,262	641,451	89,848	438,386	528,234	21.7	78.3	17.0	83.0	66.9	68.0
West Virginia	81,933,863	21,821,419	103,755,282	63,723,468	15,168,278	78,891,746	79.0	21.0	80.8	19.2	69.2	72.5
Wyoming	4,955,285	252,687	5,207,972	4,752,290	104,704	4,856,994	95.1	4.9	97.8	2.2	97.3	98.6
Total	253,043,926	42,762,359	295,806,285	191,572,264	30,803,618	222,375,882	85.5	14.5	86.1	13.9	64.3	67.0

[1] Includes mobile loaders, scrapers, and conveyors equipped with duckbills or other self-loading heads.

[2] Includes hand-loaded conveyors and pit-car loaders.

TABLE 25.—Mechanical loading underground in bituminous-coal and lignite mines in the United States, by States, in 1949

State	Number of mines				Number of loading devices					Production mechanically loaded (net tons)			Total underground production at mines using mechanical loading devices (net tons)			
	Using loading machines only [1]	Using conveyors only [2]	Using both loading machines and conveyors	Total	Mobile loading machines [3]	Scrapers	Conveyors equipped with duckbills or other self-loading heads	Pit-car loaders	Hand-loaded conveyors (number of units)	Loaded by machines [1]	Handled by conveyors [2]	Total	Mines using loading machines only [1]	Mines using conveyors only [2]	Mines using both loading machines and conveyors	Total
Alabama	18	28	13	59	147	21	38		393	5,544,898	1,943,548	7,488,446	4,179,645	1,813,187	2,579,691	8,572,523
Arkansas		18	1	19			2		73	13,411	624,915	638,326		620,948	18,411	639,359
Colorado	42	18	4	64	38	1	222		85	2,658,008	270,833	2,928,841	2,978,804	264,223	203,605	3,446,632
Illinois	76	1		77	552		14	17		30,380,047	53,900	30,433,947	30,454,451	66,016		30,520,467
Indiana	23	2		25	167				5	6,516,649	38,235	6,554,884	6,516,649	41,853		6,558,502
Iowa	1	1	1	3	2		1		2	41,492	7,941	49,433	34,492	5,765	9,176	49,433
Kentucky	124	31	36	191	450		177		492	19,691,481	3,561,187	23,252,668	20,129,101	2,487,335	6,904,039	29,520,475
Maryland	2	4		6			3		35	38,099	202,883	240,982	56,029	249,539		305,568
Montana:																
Bituminous	7	1		8	31		6		2	827,555	12,000	839,555	833,752	29,232		862,984
Lignite	1			1	2					8,756		8,756	8,756			8,756
Total Montana	8	1		9	33		6		2	836,311	12,000	848,311	842,508	29,232		871,740
New Mexico	4			4	21	4	1			788,756		788,756	803,870			803,870
North Dakota (lignite)	2			2	7					441,556		441,556	441,556			441,556
Ohio	45	12	2	59	202		112		37	9,612,295	195,582	9,807,877	9,817,348	207,748	114,470	10,139,566
Oklahoma		7	1	8	4				122	34,605	692,291	726,896		635,053	91,843	726,896
Pennsylvania	122	92	43	257	989	4	103		829	34,321,543	5,354,950	39,676,493	36,109,578	4,108,024	9,736,168	49,953,770
Tennessee	15	15	7	37	28		50		164	990,386	810,773	1,801,159	1,393,255	866,028	633,678	2,892,961
Utah	31	9		40	111	1	87		21	5,873,574	111,094	5,984,668	5,901,242	119,432		6,020,674
Virginia	28	18	9	55	132		52		152	5,223,547	1,212,118	6,435,665	5,998,284	1,225,455	2,020,573	9,244,312
Washington	3	2	4	9		7	6		85	89,848	438,386	528,234	45,848	45,102	438,236	529,186
West Virginia	232	111	100	443	1,291		366		1,800	63,723,468	15,168,278	78,891,746	58,983,672	12,190,226	20,323,854	91,497,752
Wyoming	17	1	2	20	31	8	243		15	4,752,290	104,704	4,856,994	4,687,728	5,500	171,056	4,864,284
Total:																
1949	793	371	223	1,387	4,205	46	1,483	17	4,312	191,572,264	30,803,618	222,375,882	189,374,060	24,980,666	43,244,800	257,599,526
1948	769	349	237	1,355	3,980	56	1,632	37	4,125	253,043,926	42,762,359	295,806,285	250,348,006	39,184,333	66,018,620	355,550,959
Change 1949 from 1948 (percent)	+3.1	+6.3	−5.9	+2.4	+5.7	−17.9	−9.1	−54.1	+4.5	−24.3	−28.0	−24.8	−24.4	−36.2	−34.5	−27.6

[1] Includes mobile loaders, scrapers, and conveyors equipped with duckbills or other self-loading heads; some mines in this class use conveyors or shuttle cars in conjunction with mobile loaders to perform initial phase of transportation.

[2] Includes hand-loaded conveyors and pit-car loaders.

[3] Includes continuous miners.

MECHANICAL CLEANING

Bituminous coal mechanically cleaned in 1949 totaled 153,651,903 tons, or 35 percent of the entire output.

Mechanical cleaning by wet methods includes jigs, concentrating tables, classifiers, launders, dense-medium processes, and any combinations of these five methods.

Pneumatic methods of coal cleaning include air tables, air flow, air sand, and any combination of these three methods.

Tables 26, 27, 30, and 31 include mechanical-cleaning data on all coal mined in the United States except Pennsylvania anthracite. Tables 28 and 29 are on the same basis but do not include consumer-operated plants. There are no mechanical cleaning plants at lignite mines. The percentage of total production mechanically cleaned in 1906–49 is shown in table 12.

Consumer-operated plants include those owned by steel companies that receive coal (usually from affiliated companies), clean it, and then consume it directly at the plant.

Types of Cleaning Equipment.—The tonnage of bituminous coal cleaned by wet-washing methods was 140,707,988 tons in 1949—a decrease of 15 percent from 1948. The quantity cleaned by pneumatic methods was 12,943,915 tons—a 20-percent decrease.

Table 27 compares the number of cleaning plants and the tons of cleaned coal, by types of equipment, for 1948 and 1949. During 1949, 550 wet-washing and 88 pneumatic cleaning plants were in operation. Sixty-seven tipples used both wet and dry methods at the same plant; deducting these duplications gives a net total of 571 plants that cleaned coal in 1949, an increase of 69 plants over 1948.

Mines served by cleaning plants (exclusive of those that ship to washeries operated by steel companies) produced 206,322,165 tons, or 47 percent of the total bituminous output in 1949. In this same group of mines, 145,602,899 tons were cleaned mechanically; therefore, 71 percent of the coal produced at mines with cleaning plants in 1949 was cleaned at the mine. The remainder of the output from these mines (29 percent) presumably represents the larger sizes commonly picked by hand. (*See* tables 29 and 31.)

Relation Between Raw Coal, Clean Coal, and Refuse.—For every 100 tons of raw coal cleaned during 1949 at the mines, 83 tons of clean merchantable coal, on an average, were obtained, and 17 tons of refuse were discarded. Table 31 shows total production of mines with cleaning plants and results of cleaning operations, by States.

Methods of Mining at Mines Served by Cleaning Plants.—Underground mechanical loading appears to be closely related to mechanical cleaning. Underground coal loaded mechanically in 1949 totaled 222,375,882 tons, of which 142,796,556 tons (64 percent) passed through tipples equipped with mechanical cleaning devices. Production of coal from strip mines in 1949 was 106,045,299 tons, of which 38,972,049 tons (37 percent) came from strip mines having mechanical cleaning tipples. Hand-loaded underground coal production in 1949 totaled 109,446,855 tons, of which 22 percent passed through tipples equipped with cleaning plants. (*See* tables 13 and 29.)

TABLE 26.—Bituminous coal mechanically cleaned by wet and pneumatic methods, in the United States, in net tons of clean coal, 1946–49

Method of cleaning	1946	1947	1948	1949	Change from 1948 (percent)
Wet methods:					
At mines	115,120,292	145,958,413	154,262,590	132,658,984	−14.0
At consumer-operated cleaning plants	6,938,347	10,125,039	10,401,932	8,049,004	−22.6
Total wet methods	122,058,639	156,083,452	164,664,522	140,707,988	−14.5
Pneumatic methods	16,611,198	18,352,485	16,215,801	12,943,915	−20.2
Grand total	138,669,837	174,435,937	180,880,323	153,651,903	−15.1

TABLE 27.—Bituminous coal cleaned in the United States, by type of equipment in actual operation, 1948–49

[Coal cleaned and plants operated by consumers at central washeries in Colorado and Pennsylvania included]

Type of equipment	Plants in operation		Net tons of clean coal		Cleaned by each type (percent of total)	
	1948	1949	1948	1949	1948	1949
Wet methods:						
Jigs	249	280	87,506,353	72,422,697	48.4	47.1
Concentrating tables	11	15	4,359,859	4,039,533	2.4	2.6
Classifiers	74	82	18,304,622	14,865,261	10.1	9.7
Launders	18	18	16,787,899	11,238,108	9.3	7.3
Dense-media	86	104	20,637,635	17,821,524	11.4	11.6
Jigs and concentrating tables	15	15	5,252,035	3,257,798	2.9	2.2
Other combinations and methods	29	36	11,816,119	17,033,067	6.5	11.1
Total wet methods	482	550	164,664,522	140,707,988	91.0	91.6
Pneumatic methods	84	88	16,215,801	12,943,915	9.0	8.4
Grand total	[1] 566	[1] 638	180,880,323	153,651,903	100.0	100.0

[1] Number of plants using both wet and pneumatic methods was 64 in 1948 and 67 in 1949.

TABLE 28.—Total production from bituminous-coal mines served by cleaning plants in the United States, 1948–49, in net tons

[Does not include estimates for mines that may ship to consumer-operated plants]

Type of equipment	1948	1949	Change from 1948 (percent)
Wet methods:			
Jigs	127,475,329	97,793,857	−23.3
Concentrating tables	1,659,611	2,611,233	+57.3
Classifiers	35,275,913	28,898,305	−18.1
Launders	16,000,190	10,606,983	−33.7
Dense-media	40,965,796	34,283,028	−16.3
Jigs and concentrating tables	5,552,845	3,492,223	−37.1
Other combinations and methods	16,929,753	23,370,652	+38.0
Total wet methods	243,859,437	201,056,281	−17.6
Pneumatic methods	56,288,590	40,612,954	−27.8
Grand total	300,148,027	241,669,235	−19.5
Less duplications [1]	48,436,486	35,347,070	−27.0
Net total	251,711,541	206,322,165	−18.0
United States total production [2]	599,518,229	437,868,036	−27.0
Percent produced at mines having cleaning plants	42.0	47.1	----------

[1] Mines using both wet and pneumatic methods.
[2] Includes all coal except Pennsylvania anthracite. There are no mechanical cleaning plants at lignite mines.

TABLE 29.—Total production from bituminous-coal mines served by cleaning plants in the United States, by method of mining, 1946–49

[Does not include estimates for mines that may ship to consumer-operated plants]

Method of mining	1946		1947		1948		1949	
	Thousand tons	Percent	Thousand tons	Percent	Thousand tons	Percent	Thousand tons	Percent
Mined from strip pits	33,222	16.6	42,016	17.2	44,305	17.6	38,972	18.9
Mechanically loaded underground	125,521	62.7	158,507	64.8	171,346	68.1	142,797	69.2
Hand-loaded underground	41,531	20.7	43,988	18.0	36,061	14.3	24,553	11.9
Total	200,274	100.0	244,511	100.0	251,712	100.0	206,322	100.0

TABLE 30.—Bituminous coal mechanically cleaned by wet and pneumatic methods in the United States, by States, 1948–49

[Coal cleaned and plants operated by consumers at central washeries in Colorado and Pennsylvania included]

State	Plants in operation		Net tons of clean coal		Output mechanically cleaned (percent)	
	1948	1949	1948	1949	1948	1949
Alabama	55	56	13,463,049	9,360,954	71.6	72.4
Alaska	1	2	147,360	190,384	36.1	43.9
Arkansas	4	3	134,569	55,491	8.1	5.8
Colorado	8	8	1,530,318	1,223,987	27.2	26.4
Illinois	55	62	34,619,845	27,428,245	53.0	58.1
Indiana	22	26	13,530,612	10,548,456	56.7	63.7
Kansas	3	5	1,191,344	1,101,022	46.9	54.2
Kentucky	37	52	11,560,556	12,894,543	14.1	20.6
Maryland	2	2	216,637	71,914	13.0	10.8
Missouri	9	9	3,310,227	3,004,757	82.3	82.4
Montana	3	2	182,721	182,411	6.3	6.6
New Mexico	2	2	411,325	339,672	30.2	33.8
Ohio	19	20	10,340,972	9,011,617	26.7	29.1
Oklahoma	2	5	706,311	738,718	20.4	24.4
Pennsylvania [1]	66	78	35,602,133	31,984,239	26.5	35.9
Tennessee	3	4	266,900	193,884	4.1	4.6
Utah	5	5	2,134,386	2,086,754	31.3	33.9
Virginia	21	21	4,098,567	3,714,188	22.8	25.5
Washington	20	19	1,055,749	802,071	86.5	89.2
West Virginia [2]	165	190	46,376,742	38,718,596	27.5	31.6
Total	[3] 502	[4] 571	180,880,323	153,651,903	30.2	35.1

[1] Includes some coal mined in Pennsylvania and cleaned in Ohio and a small tonnage mined in other States and cleaned at a consumer-operated plant in Pennsylvania.
[2] Includes some coal mined in West Virginia and cleaned in Ohio and Pennsylvania.
[3] Represents 64 plants using both wet and pneumatic methods of cleaning and 438 plants using only 1 cleaning method.
[4] Represents 67 plants using both wet and pneumatic methods of cleaning and 504 plants using only 1 cleaning method.

TABLE 31.—Operations at bituminous-coal-cleaning plants in the United States, by States, in net tons, in 1949

State	Total raw coal moved to cleaning plants	Coal obtained in cleaning process	Refuse resulting in cleaning process	Ratio of refuse to raw coal (percent) [1]	Total production from mines served by cleaning plants
Alabama	12,806,624	9,360,954	3,445,670	26.9	9,802,007
Alaska	249,085	190,384	58,701	23.6	190,720
Arkansas	64,991	55,491	9,500	14.6	209,411
Colorado	134,062	123,041	11,021	8.2	563,110
Illinois	33,130,226	27,428,245	5,701,981	17.2	37,723,135
Indiana	12,204,622	10,548,456	1,656,166	13.6	12,759,347
Kansas	1,381,829	1,101,022	280,807	20.3	1,220,381
Kentucky	15,631,029	12,894,543	2,736,486	17.5	17,730,655
Maryland	86,107	71,914	14,193	16.5	216,129
Missouri	3,830,856	3,004,757	826,099	21.6	3,058,323
Montana	195,511	182,411	13,100	6.7	220,341
New Mexico	467,963	339,672	128,291	27.4	666,939
Ohio	11,323,570	9,011,617	2,311,953	20.4	11,792,199
Oklahoma	870,051	738,718	131,333	15.1	1,122,263
Pennsylvania [2]	30,560,607	25,036,181	5,524,426	18.1	32,333,632
Tennessee	223,186	193,884	29,302	13.1	605,215
Utah	2,195,919	2,086,754	109,165	5.0	2,491,551
Virginia	4,119,971	3,714,188	405,783	9.8	6,825,104
Washington	1,001,507	802,071	199,436	19.9	829,786
West Virginia [3]	45,295,837	38,718,596	6,577,241	14.5	65,961,917
Total at mines only [4]	175,773,553	145,602,899	30,170,654	17.2	206,322,165
Consumer plants [5]	8,917,449	8,049,004	868,445	9.7	
Grand total 1949	184,691,002	153,651,903	31,039,099	16.8	

[1] In Alabama (for example) for every 100 tons of raw coal cleaned in 1949, an average of 26.9 tons of refuse was discarded and 73.1 tons of clean marketable coal was obtained.
[2] Includes some coal that was mined in Pennsylvania and cleaned in Ohio.
[3] Includes some coal that was mined in West Virginia and cleaned in Ohio and Pennsylvania.
[4] Includes all mechanical cleaning other than washeries operated by consumer steel companies.
[5] Includes central washeries in Colorado and Pennsylvania operated by consumer steel companies.

MECHANICAL CRUSHING [9]

TABLE 32.—Mechanical crushing of bituminous coal at mines in the United States, 1940 and 1944–49 [1]

[Production figures in millions of net tons]

	1940	1944	1945	1946	1947	1948	1949
Grand total production—bituminous coal and lignite	460.8	619.6	577.6	533.9	630.6	599.5	437.9
Total production at mines where crushing is done	183.1	224.5	218.7	209.5	249.5	250.0	198.1
Production crushed	35.3	66.5	70.9	66.7	89.0	91.6	77.3
Number of mines crushing coal	716	814	830	851	904	995	1,120
Percentage of production crushed at mines where crushing is done	19.3	29.6	32.4	31.8	35.7	36.6	39.0
Percentage of total production crushed	7.7	10.8	12.3	12.5	14.1	15.3	17.7
Percentage of production mechanically cleaned at mines where crushing is done	(2)	(2)	(2)	39.9	41.4	42.1	47.3
Percentage of total production mechanically cleaned	22.2	25.6	25.6	26.0	27.7	30.2	35.1
Percentage of total production of mines where crushing is done:							
Mechanically loaded	(2)	(2)	(2)	52.8	56.0	59.0	61.4
Hand loaded	(2)	(2)	(2)	19.9	16.5	13.3	11.5
Strip mined	(2)	(2)	(2)	27.3	27.5	27.7	27.1
Total				100.0	100.0	100.0	100.0

[1] Exclusive of lignite and Virginia semianthracite. Data for 1940 and 1944–45 include mines with an average daily production of 50 tons and over and all mines with rail or river connections, regardless of size. Data for 1946–49 include all mines producing annually 1,000 tons and over. The figures are reasonably comparable for all the years.

[2] Data not available.

[9] Detailed data, by States and districts, for 1946–49, published in Bureau of Mines Weekly Coal Report 1740, Jan. 19, 1951.

TREATMENT [10]

TABLE 33.—Treatment of bituminous coal for allaying dust in the United States, 1940–49 [1]

	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Grand total production—bituminous coal and lignite (net tons)	460,771,500	514,149,245	582,692,937	590,177,069	619,576,240	577,617,327	533,922,068	630,623,722	599,518,229	437,868,036
Total production at mines where coal was treated (net tons)	161,089,959	197,476,343	202,973,885	153,863,052	172,955,108	166,935,955	166,814,848	195,840,059	196,600,489	160,978,742
Net tons treated with:										
Calcium chloride	2,633,291	3,957,459	10,132,809	15,049,176	7,276,702	5,115,090	4,957,622	5,822,483	6,275,121	3,670,120
Oil	25,767,651	29,258,462	11,302,020	1,720,176	13,188,883	18,875,674	24,310,109	34,667,571	34,466,534	30,448,670
Calcium chloride and oil	4,428,113	2,482,899	6,544,658	1,947,219	4,744,580	4,647,872	3,193,070	5,571,953	4,177,987	4,380,961
All other materials	2,807,728	3,844,476	7,148,064	7,966,484	5,562,565	4,910,602	4,572,360	5,732,101	5,462,054	3,275,151
Total	35,636,783	39,543,296	35,127,551	26,683,055	30,772,730	33,549,238	37,033,161	51,794,108	50,381,696	41,774,902
Percent of total production treated	7.7	7.7	6.0	4.5	5.0	5.8	6.9	8.2	8.4	9.5
Percent of production treated at mines where treating is done	22.1	20.0	17.3	17.3	17.8	20.1	22.2	26.4	25.6	26.0
Percent of tonnage treated with:										
Calcium chloride	7.4	10.0	28.8	56.4	23.6	15.2	13.4	11.2	12.5	8.8
Oil	72.3	74.0	32.2	6.4	42.9	56.3	65.6	66.9	68.4	72.9
Calcium chloride and oil	12.4	6.3	18.6	7.3	15.4	13.9	8.6	10.8	8.3	10.5
All other materials	7.9	9.7	20.4	29.9	18.1	14.6	12.4	11.1	10.8	7.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of mines treating with:										
Calcium chloride	51	67	167	212	145	105	79	67	68	91
Oil	486	564	334	67	192	296	380	384	474	586
Calcium chloride and oil	22	15	73	28	47	43	41	58	48	62
All other materials	62	58	117	101	83	67	51	45	46	34
Total [2]	614	668	603	393	434	487	546	546	629	769

[1] Exclusive of lignite and Virginia semianthracite. Data for 1940-45, inclusive, include mines with an average daily production of 50 tons and all mines with rail or river connections regardless of size. Data for 1946–49, inclusive, include all mines producing 1,000 tons and over. The figures are reasonably comparable for all the years.

[2] On account of some mines using more than one method of treatment, this total is not the sum of the above items.

[10] Detailed data, by States and districts, for 1946-49, published in Bureau of Mines Weekly Coal Report 1741, Jan. 26, 1951.

BY STATES AND COUNTIES

Detailed production and employment statistics are given in table 34 for each coal-producing county in the United States from which three or more operators submitted reports for 1949. Statistics on counties with less than three reporting producers have been combined with data for other counties in the same State to avoid disclosing individual figures, unless the operators have granted permission to publish them separately. Production of mines on the border between two States has been credited to the State from which the coal was extracted rather than to that in which the tipple was situated. If the coal is mined from lands in both States, the tonnage has been apportioned accordingly.

The data in the present report, as in those published for many years by the Bureau of Mines, relate only to mines with an annual output of 1,000 tons or more. That fact should be borne in mind when the statistics in this report are compared with similar data compiled by State mine departments. Differences arise largely from variations in coverage by State reports, some of which include data for all mines regardless of size, and others only data for mines employing more than a specified minimum number, ranging from 2 to 10 men.

Because of a change in method of reporting, beginning with 1946, statistics of average production per man per day are not precisely comparable with those for other years. The figures since 1946 are based on the average number of men working daily, whereas the figures for previous years were based on the average number of men on the rolls per pay period.

Coal data by States are also shown elsewhere in this chapter in tables 5, 6, 9, 10, 11, 13, 15, 16, 17, 19, 22, 24, 25, 30, 31, 35, 42, 43, 44, and 51. Of these, tables 19 and 44 show counties separately.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton[3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day[4]
	Shipped by rail or water[1]	Shipped by truck	Used at mine[2]	Total		Underground	Surface		Total			
							In strip pits	All others				
ALABAMA												
Bibb	367,617	26,461	11,794	405,872	$6.88	743	8	203	954	134	127,814	3.18
Blount	223,598	178,887	1,316	403,801	6.44	338	101	72	511	192	98,274	4.11
Cullman	780	38,471	25	39,276	6.11	64	8	6	78	186	14,489	2.71
Etowah	11,829	1,564	--------	13,393	4.54	--------	7	1	8	300	2,400	5.58
Jackson	--------	5,981	--------	5,981	5.60	11	--------	2	13	189	2,457	2.43
Jefferson	6,983,350	304,071	53,327	7,340,748	6.13	10,454	307	2,246	13,007	156	2,032,116	3.61
Marion	201,789	184,161	1,691	387,641	7.81	724	--------	131	855	177	150,933	2.57
St. Clair	534,715	36,514	5,357	576,586	6.10	791	15	110	916	174	159,760	3.61
Shelby	214,043	58,251	1,481	273,775	6.69	534	--------	82	616	148	91,051	3.01
Tuscaloosa	472,062	211,859	1,097	685,018	5.22	378	152	170	700	158	110,358	6.21
Walker	1,966,891	527,602	288,214	2,782,707	5.90	3,288	287	609	4,184	131	546,785	5.09
Winston	4,250	14,782	--------	19,032	5.97	32	--------	1	33	189	6,237	3.05
Total Alabama	10,980,924	1,588,604	364,302	12,933,830	6.12	17,357	885	3,633	21,875	153	3,342,674	3.87
ALASKA												
Total **Alaska**	422,977	5,703	4,853	433,533	$7.63	153	77	84	314	263	82,477	5.26
ARIZONA												
Total **Arizona**	--------	4,850	--------	4,850	$4.85	9	--------	--------	9	237	2,137	2.27

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: In strip pits	Surface: All others	Total			
ARKANSAS												
Franklin	80,874		2,082	82,956	$7.41	183	31	31	245	124	30,461	2.72
Johnson	191,898	9,868	481	202,247	7.31	240	74	99	413	104	43,019	4.70
Logan	183,877	1,773	1,244	186,894	9.23	467	8	96	571	115	65,901	2.84
Pope	35,479		254	35,733	8.30	83		23	106	132	13,992	2.55
Sebastian	447,932	5,234	515	453,681	7.53	674	98	117	889	140	124,405	3.65
Total Arkansas	940,060	16,875	4,576	961,511	7.84	1,647	211	366	2,224	125	277,778	3.46
CALIFORNIA (LIGNITE)												
Total California		3,900		3,900	$10.00		3		3	156	468	8.33
COLORADO												
Boulder	25,261	136,717	3,272	165,250	$5.10	169		38	207	156	32,286	5.12
Delta	53,082	27,878	3,556	84,516	4.67	69		23	92	208	19,176	4.41
Elbert		1,050	45	1,095	3.62	2			2	224	447	2.45
El Paso	25,585	76,221	25,186	126,992	4.59	118	5	21	144	216	30,969	4.10
Fremont	83,891	254,577	1,183	339,651	4.66	246	4	67	317	196	62,033	5.48
Garfield	10,968	38,699		49,667	4.82	29		6	35	243	8,519	5.83
Gunnison	420,258	47,123	24,104	491,485	5.26	372		139	511	162	82,816	5.93
Huerfano	350,414	85,920	2,796	439,130	5.40	439	15	111	565	169	95,375	4.60
Jackson	5,005	3,533		8,538	5.19		9	1	10	114	1,140	7.49
Jefferson	74,391	13,320	847	88,558	4.85	91		20	111	191	21,183	4.18
La Plata	17,548	25,356	2,187	45,091	3.64	41		6	47	190	8,931	5.05
Las Animas	824,018	46,921	18,367	889,306	5.96	1,158		189	1,347	177	238,617	3.73
Mesa	65,739	24,161	2,875	92,775	4.68	81		15	96	184	17,692	5.24
Moffat	104,775	25,629		130,404	5.29	69		24	93	167	15,522	8.40
Montezuma		1,295		1,295	5.18	1			1	251	251	5.16
Montrose		3,287	11,856	15,143	4.30	20		2	22	124	2,726	5.56
Pitkin		4,327		4,327	5.18	3			3	243	729	5.94
Rio Blanco	15,000	17,844	63	32,907	4.70	20		8	28	198	5,541	5.94

Routt	748,069	33,963	25,257	807,289	5.12	548	86	281	915	126	114,889	7.03
Weld	534,762	271,568	16,683	823,013	4.47	555	18	120	693	143	99,074	8.31
Total Colorado	3,358,766	1,139,389	138,277	4,636,432	5.12	4,031	137	1,071	5,239	164	857,916	5.40
IDAHO												
Total Idaho	----------	3,219	----------	3,219	$7.78	10	--------	2	12	180	2,160	1.49
ILLINOIS												
Bureau	466,475	92,766	344	559,585	$4.55	--------	64	110	174	191	33,313	16.80
Christian	5,101,070	64,730	54,273	5,220,073	3.39	2,549	--------	851	3,400	160	543,272	9.61
Clinton	82,452	125,210	7,294	214,956	3.96	222	--------	56	278	174	48,430	4.44
Douglas	61,465	14,488	----------	75,953	4.27	65	--------	10	75	157	11,775	6.45
Edgar	----------	8,700	400	9,100	5.00	40	--------	5	45	72	3,240	2.81
Franklin	7,390,399	177,080	179,764	7,747,243	4.48	5,546	--------	2,188	7,734	149	1,151,519	6.73
Fulton	3,790,572	344,517	12,191	4,147,280	3.73	231	418	618	1,267	182	230,890	17.96
Gallatin	22,462	37,047	1,800	61,309	3.85	54	--------	16	70	156	10,933	5.61
Hancock	11,583	41,913	231	53,727	5.01	--------	18	8	26	156	4,056	13.25
Henry	72,866	58,565	907	132,338	4.63	61	--------	15	76	233	17,721	7.47
Jackson	750,644	80,964	10,483	842,091	3.89	304	113	181	598	148	88,208	9.55
Jefferson	250,038	26,835	22,273	299,146	4.16	293	--------	93	386	130	50,317	5.95
Knox	1,522,385	104,906	1,998	1,629,289	3.63	90	157	289	536	188	100,633	16.19
La Salle	21,965	50,169	7,271	79,405	5.59	90	41	31	162	80	12,902	6.15
Livingston	----------	6,766	----------	6,766	5.81	--------	6	--------	6	101	606	11.17
Logan	----------	51,074	----------	51,074	5.33	55	--------	8	63	180	11,364	4.49
Macoupin	3,490,177	122,674	156,738	3,769,589	3.60	2,062	--------	564	2,626	209	549,539	6.86
Madison	714,698	860,326	61,390	1,636,414	4.20	1,019	--------	270	1,289	200	257,233	6.36
Marion	106,092	22,621	5,909	134,622	3.94	114	--------	39	153	147	22,491	5.99
Menard	----------	23,960	349	24,309	5.37	44	--------	8	52	176	9,156	2.65
Montgomery	634,667	37,876	53,744	726,287	3.95	264	--------	81	345	225	77,625	9.36
Morgan	----------	4,204	----------	4,204	4.00	--------	6	--------	6	138	828	5.08
Peoria	264,629	268,909	2,733	536,271	3.98	398	54	79	531	154	81,694	6.56
Perry	3,618,386	108,454	43,054	3,769,894	3.82	1,059	424	657	2,140	160	341,371	11.04
Randolph	1,423,429	104,104	20,113	1,547,646	3.72	515	60	284	859	127	108,818	14.22
St. Clair	1,189,659	1,559,610	40,836	2,790,105	3.85	961	164	318	1,443	181	261,488	10.67
Saline	3,986,246	102,111	70,626	4,158,983	4.61	1,971	121	688	2,780	196	545,023	7.63
Sangamon	692,705	609,965	22,529	1,325,199	4.24	1,212	--------	261	1,473	151	222,864	5.95
Schuyler	14,100	26,939	10	41,049	4.67	17	25	29	71	102	7,269	5.65
Tazewell	----------	53,705	2,421	56,126	5.93	69	--------	11	80	160	12,826	4.38
Vermilion	435,865	248,569	2,231	686,665	4.34	179	95	75	349	139	48,607	14.13
Warren	----------	2,609	20	2,629	4.29	4	--------	1	5	266	1,330	1.98
Washington	110,011	28,954	4,472	143,437	4.14	298	--------	77	375	64	24,184	5.93
Williamson	3,155,069	216,458	137,596	3,509,123	4.24	1,916	167	644	2,727	136	369,626	9.49
Woodford	----------	11,521	----------	11,521	6.90	48	--------	8	56	152	8,512	1.35
Other counties: Grundy and Will	893,570	307,813	3,168	1,204,551	5.06	9	276	250	535	168	89,964	13.39
Total Illinois	40,273,679	6,007,112	927,168	47,207,959	4.04	21,759	2,209	8,823	32,791	163	5,359,627	8.81

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: In strip pits	Surface: All others	Total			
INDIANA												
Clay	1,044,404	106,702	4,933	1,156,039	$4.27	16	322	195	533	173	91,995	12.57
Daviess	328,633	24,625	-	353,258	4.38	21	45	54	120	157	18,808	18.78
Dubois	-	7,410	-	7,410	3.75	4	-	-	4	296	1,184	6.26
Fountain	-	69,188	-	69,188	5.17	-	20	10	30	176	5,280	13.10
Gibson	369,295	73,888	13,288	456,471	4.54	484	25	85	594	97	57,783	7.90
Greene	613,748	55,466	1,997	671,211	4.27	17	143	96	256	160	40,872	16.42
Knox	1,890,158	323,987	23,382	2,237,527	3.76	1,336	137	527	2,000	143	285,344	7.84
Martin	-	2,914	-	2,914	4.15	6	-	2	8	175	1,400	2.08
Owen	115,568	9,986	530	126,084	4.52	-	34	7	41	228	9,355	13.48
Parke	309	70,226	70	70,605	5.42	37	41	12	90	109	9,853	7.17
Perry	-	3,200	-	3,200	3.31	5	-	1	6	183	1,100	2.91
Pike	2,555,021	33,106	15,740	2,603,867	3.89	-	584	304	888	189	168,095	15.49
Spencer	139,122	29,286	-	168,408	4.06	17	80	21	118	152	17,950	9.38
Sullivan	2,244,508	107,306	9,088	2,360,902	4.21	987	194	305	1,486	154	229,502	10.29
Vermillion	394,557	42,640	5,304	442,501	3.94	57	95	65	217	167	36,338	12.18
Vigo	2,714,562	221,706	302,127	3,238,395	4.10	2,013	148	487	2,648	151	400,119	8.09
Warrick	2,359,339	214,814	7,623	2,581,776	3.88	457	365	348	1,170	151	176,588	14.62
Total Indiana	14,769,224	1,396,450	384,082	16,549,756	4.05	5,457	2,233	2,519	10,209	152	1,551,566	10.67
IOWA												
Appanoose	41,801	120,007	1,361	163,169	$5.08	375	-	50	425	164	69,708	2.34
Boone	4,807	40,529	-	45,336	5.39	65	-	10	75	164	12,309	3.68
Dallas	66,297	8,765	-	75,062	4.71	102	-	17	119	125	14,875	5.05
Davis	1,050	48,894	-	49,944	3.68	43	11	6	60	218	13,080	3.82
Greene	-	6,610	130	6,740	5.44	7	-	2	9	261	2,352	2.87
Guthrie	-	3,840	16	3,856	8.00	13	-	2	15	168	2,520	1.53
Jasper	-	31,502	-	31,502	4.52	58	-	9	67	185	12,403	2.54
Lucas	8,414	19,481	-	27,895	5.58	65	-	8	73	101	7,371	3.78

23294—53——21

Mahaska	90,012	102,288	70	192,370	3.75	18	88	27	133	211	28,072	6.85
Marion	458,310	367,665	189	826,164	3.55	187	206	107	500	199	99,564	8.30
Monroe	49,265	84,131	863	134,259	4.56	257	-------	41	298	131	39,042	3.44
Page	-------	8,062	-------	8,062	6.50	17	-------	3	20	220	4,400	1.83
Van Buren	4,418	61,349	11	65,778	4.35	26	22	18	66	167	11,043	5.96
Wapello	25,000	54,783	-------	79,783	3.41	18	31	17	66	170	11,243	7.10
Warren	-------	13,349	10	13,359	4.31	18	-------	3	21	207	4,346	3.07
Wayne	-------	1,205	-------	1,205	4.65	6	-------	-------	6	130	780	1.54
Total Iowa	749,374	972,460	2,650	1,724,484	4.01	1,275	358	320	1,953	171	333,108	5.18
KANSAS												
Bourbon	117,349	20,824	881	139,054	$4.11	-------	71	26	97	132	12,757	10.90
Cherokee	685,739	37,392	564	723,695	4.02	41	163	113	317	181	57,397	12.61
Coffey	-------	2,000	-------	2,000	5.00	-------	4	-------	4	120	480	4.17
Crawford	800,931	44,653	6,874	852,458	3.80	228	199	141	568	159	90,525	9.42
Franklin	-------	1,715	-------	1,715	4.81	6	-------	1	7	155	1,085	1.58
Labette	-------	1,686	-------	1,686	4.77	-------	3	-------	3	191	573	2.94
Linn	277,581	4,377	-------	281,958	3.66	8	24	25	57	227	12,945	21.78
Osage	-------	28,458	93	28,551	6.54	79	10	9	98	173	16,906	1.69
Total Kansas	1,881,600	141,105	8,412	2,031,117	3.92	362	474	315	1,151	167	192,668	10.54
KENTUCKY												
Eastern Kentucky:												
Bell	1,339,004	263,588	12,002	1,614,594	$5.76	2,541	6	367	2,914	126	367,013	4.40
Boyd	91,681	420,929	6,979	519,589	4.54	335	60	65	460	135	61,992	8.38
Breathitt	432,829	294,250	26,704	753,783	5.10	641	90	116	847	162	137,182	5.49
Carter	31,356	320,770	-------	352,126	5.10	380	-------	65	445	173	77,014	4.57
Clay	529,031	204,397	-------	733,428	5.46	1,092	34	204	1,330	191	254,045	2.89
Clinton	-------	27,938	-------	27,938	4.20	31	-------	4	35	169	5,908	4.73
Elliott	3,950	122,086	-------	126,036	4.25	118	5	20	143	217	31,056	4.06
Floyd	4,331,124	696,434	10,457	5,038,015	6.41	5,976	-------	1,096	7,072	144	1,021,160	4.93
Greenup	-------	152,796	-------	152,796	4.55	145	-------	25	170	213	36,218	4.22
Harlan	7,839,912	151,086	104,723	8,095,721	6.24	10,817	-------	1,741	12,558	153	1,919,000	4.22
Jackson	-------	138,468	2,222	140,690	5.08	186	11	31	228	185	42,138	3.34
Johnson	384,523	321,227	1,839	707,589	6.07	1,124	-------	185	1,309	117	152,613	4.64
Knott	625,842	620,975	501	1,247,318	5.32	1,146	8	189	1,343	132	176,664	7.06
Knox	212,492	469,348	820	682,660	5.74	994	9	155	1,158	117	135,723	5.03
Laurel	20,300	74,931	357	95,588	5.17	131	7	24	162	151	24,390	3.92
Lawrence	-------	62,791	-------	62,791	4.47	73	-------	10	83	166	13,772	4.56
Lee	64,919	58,292	-------	123,211	5.07	170	-------	33	203	215	43,651	2.82
Leslie	2,074,671	485,962	493	2,561,126	5.94	1,497	30	278	1,805	170	306,602	8.35
Letcher	4,326,008	2,216,018	35,111	6,577,137	5.23	6,678	73	1,331	8,082	137	1,105,413	5.95
Magoffin	14,629	47,223	-------	61,852	4.82	129	-------	20	149	91	13,584	4.55

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: In strip pits	Surface: All others	Total			
KENTUCKY—Continued												
Eastern Kentucky—continued												
Martin	208,233	13,226	121	221,580	$4.90	294		60	354	113	40,164	5.52
McCreary	376,353	126,361	6,510	509,224	5.39	852	62	130	1,044	106	110,608	4.60
Morgan		134,572		134,572	5.16	111	15	23	149	163	24,272	5.54
Owsley		7,750		7,750	5.75	16		2	18	201	3,615	2.14
Perry	4,499,673	422,330	46,244	4,968,247	5.65	5,382	18	999	6,399	135	865,474	5.74
Pike	7,398,038	661,270	113,407	8,172,715	4.92	8,545		1,591	10,136	137	1,389,530	5.88
Pulaski	28,700	141,588		170,288	4.70	159		26	185	198	36,627	4.65
Rockcastle	6,150	142,223		148,373	4.73	66	29	21	116	174	20,144	7.37
Wayne		30,172		30,172	3.85	41		6	47	165	7,742	3.90
Whitley	243,408	16,392	702	260,502	5.57	384	34	72	490	144	70,737	3.68
Wolfe		256,676		256,676	5.17	232	39	52	323	147	47,375	5.42
Total Eastern Kentucky	35,082,826	9,102,069	369,192	44,554,087	5.60	50,286	530	8,941	59,757	143	8,541,426	5.22
Western Kentucky:												
Butler		63,465		63,465	4.01	74	8	14	96	180	17,288	3.67
Christian	5,000	15,600		20,600	4.19	23		4	27	113	3,060	6.73
Daviess	85,350	463,766	32	549,148	3.35	255	38	68	361	185	66,876	8.21
Edmonson		16,500		16,500	3.82	10	5	2	17	163	2,768	5.96
Grayson		32,251		32,251	4.11		32	12	44	140	6,153	5.24
Hancock	85,273	111,124		196,397	3.59	7	34	23	64	221	14,151	13.88
Henderson	16,800	226,942		243,742	3.10	254		43	297	166	49,163	4.96
Hopkins	10,309,766	512,937	5,858	10,828,561	3.70	2,206	655	1,274	4,135	182	754,310	14.36
McLean	3,350	48,177		51,527	4.10	71	3	11	85	117	9,982	5.16
Muhlenberg	3,443,324	110,976	43,182	3,597,482	3.57	1,979	248	624	2,851	118	336,121	10.70
Ohio	1,385,230	91,214	966	1,477,410	3.80	317	210	231	758	118	89,148	16.57
Union	572,266	67,250	3,127	642,643	3.63	296		66	362	193	69,883	9.20
Webster	296,043	13,368	40	309,451	3.04	205	33	43	281	117	32,981	9.38
Total Western Kentucky	16,202,402	1,773,570	53,205	18,029,177	3.66	5,697	1,266	2,415	9,378	155	1,451,884	12.42
Total Kentucky	51,285,228	10,875,639	422,397	62,583,264	5.04	55,983	1,796	11,356	69,135	145	9,993,310	6.26

MARYLAND												
Allegany	109,905	125,163	422	235,490	$5.46	501	26	86	613	110	67,637	3.48
Garrett	353,137	77,592	2,113	432,842	5.13	650	42	105	797	126	100,683	4.30
Total Maryland	463,042	202,755	2,535	668,332	5.24	1,151	68	191	1,410	119	168,320	3.97
MICHIGAN												
Total Michigan	--------	9,843	1,607	11,450	$10.12	24	--------	4	28	175	4,900	2.34
MISSOURI												
Adair	--------	94,789	180	94,969	$4.60	137	--------	25	162	180	29,208	3.25
Barton	255,750	27,979	1,190	284,919	4.20	--------	52	37	89	218	19,396	14.69
Bates	743,821	9,869	--------	753,690	3.66	--------	69	71	140	224	31,334	24.05
Boone	--------	55,117	--------	55,117	4.24	--------	17	4	21	257	5,388	10.23
Callaway	--------	134,533	20	134,553	5.27	--------	48	15	63	258	16,234	8.29
Clay	--------	33,245	1,173	34,418	7.14	120	--------	12	132	118	15,532	2.22
Dade	--------	1,378	--------	1,378	4.00	--------	3	--------	3	200	600	2.30
Daviess	--------	7,572	--------	7,572	6.14	21	--------	4	25	156	3,900	1.94
Harrison	--------	3,382	--------	3,382	5.91	9	--------	1	10	200	2,000	1.69
Henry	463,045	77,707	218	540,970	3.97	--------	122	53	175	235	41,129	13.15
Jasper	--------	1,949	380	2,329	4.29	--------	5	--------	5	190	950	2.45
Johnson	118,626	12,646	302	131,574	4.05	--------	25	18	43	214	9,199	14.30
Lafayette	--------	39,121	876	39,997	6.33	111	--------	11	122	156	19,025	2.10
Linn	--------	10,658	--------	10,658	6.03	32	--------	4	36	172	6,192	1.72
Macon	757,618	45,673	--------	803,291	3.92	32	62	104	198	238	47,096	17.06
Monroe	--------	4,208	--------	4,208	5.25	--------	6	2	8	201	1,608	2.62
Putnam	--------	24,910	--------	24,910	5.04	60	--------	10	70	161	11,300	2.20
Ralls	--------	8,283	--------	8,283	5.45	6	12	--------	18	167	3,012	2.75
Randolph	450,999	66,000	--------	516,999	4.20	146	37	61	244	201	48,943	10.56
Ray	--------	15,257	--------	15,257	7.45	50	--------	7	57	137	7,800	1.96
St. Clair	26,407	3,651	--------	30,058	3.54	--------	21	7	28	151	4,233	7.10
Vernon	125,885	22,993	46	148,924	3.58	--------	68	28	96	149	14,298	10.42
Total Missouri	2,942,151	700,920	4,385	3,647,456	4.09	724	547	474	1,745	194	338,377	10.78

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: In strip pits	Surface: All others	Total			
MONTANA												
Bituminous coal:												
Blaine	-------	7,806	100	7,906	$6.44	5	-------	-------	5	240	1,200	6.59
Carbon	205,666	15,202	548	221,416	4.55	108	-------	47	155	186	28,825	7.68
Cascade	1,174	8,840	-------	10,014	5.96	11	-------	1	12	203	2,439	4.11
Fergus	-------	-------	1,963	1,963	5.50	2	-------	1	3	205	615	3.19
Musselshell	614,908	37,362	6,281	658,551	4.04	364	-------	158	522	186	97,345	6.77
Rosebud	1,815,976	1,743	3,366	1,821,085	1.30	3	68	20	91	258	23,507	77.47
Total bituminous coal	2,637,724	70,953	12,258	2,720,935	2.26	493	68	227	788	195	153,931	17.68
Lignite	-------	45,050	18	45,068	3.35	29	6	8	43	167	7,192	6.27
Total Montana	2,637,724	116,003	12,276	2,766,003	2.28	522	74	235	831	194	161,123	17.17
NEW MEXICO												
Bernalillo	-------	1,514	20	1,534	$4.39	4	-------	1	5	126	630	2.43
Colfax	793,465	3,699	6,706	803,870	5.03	680	-------	160	840	170	142,457	5.64
McKinley	88,106	16,192	25,920	130,218	6.16	172	-------	41	213	146	31,131	4.18
Rio Arriba	27,466	3,046	20	30,532	4.23	36	-------	9	45	199	8,974	3.40
Santa Fe	17,385	17,384	-------	34,769	6.53	64	-------	13	77	223	17,138	2.03
Socorro	-------	2,991	120	3,111	6.56	11	-------	2	13	234	3,040	1.02
Total New Mexico	926,422	44,826	32,786	1,004,034	5.21	967	-------	226	1,193	170	203,370	4.94
NORTH DAKOTA (LIGNITE)												
Total North Dakota	2,366,045	508,714	92,501	2,967,260	$2.36	133	260	244	637	238	151,639	19.57

OHIO

Athens	692,838	140,378	2,402	835,618	$4.75	933	147	318	1,398	97	134,991	6.19
Belmont	6,208,662	286,259	22,823	6,517,744	4.15	4,537	285	991	5,813	149	864,113	7.54
Carroll	263,413	297,599	7,464	568,476	3.99	316	116	79	511	169	86,472	6.57
Columbiana	195,757	1,084,858	172	1,280,787	3.45	145	332	103	580	217	125,590	10.20
Coshocton	482,670	376,955	31,786	891,411	3.89	240	178	81	499	210	104,926	8.50
Gallia	302,740	176,893		479,633	3.66	378	98	98	574	148	85,105	5.64
Guernsey	363,980	59,877	151	424,008	3.24	123	183	53	359	176	63,167	6.71
Harrison	4,962,493	93,679	6,202	5,062,374	3.98	932	428	766	2,126	148	314,549	16.09
Hocking	67,186	54,380	53	121,619	4.51	267	12	36	315	84	26,597	4.57
Holmes		6,319		6,319	2.30	8	4		12	125	1,504	4.20
Jackson	50,540	118,391	11,272	180,203	3.84	95	64	17	176	168	29,606	6.09
Jefferson	3,740,770	1,189,233	20,752	4,950,755	4.79	1,711	567	754	3,032	165	501,412	9.87
Lawrence	7,000	130,814	4,724	142,538	3.60	176	17	29	222	155	34,453	4.14
Mahoning	4,282	475,693	76,000	555,975	4.06	4	126	38	168	243	40,788	13.63
Meigs	224,564	61,147	55	285,766	3.47	187	72	49	308	166	51,128	5.59
Morgan	140,752	29,408		170,160	4.35	238	56	63	357	86	30,752	5.53
Muskingum	1,260,356	375,277	679	1,636,312	2.80	392	169	128	689	154	106,311	15.39
Noble	1,154,775	27,306	189	1,182,270	2.86	9	183	90	282	218	61,447	19.24
Perry	2,018,657	501,004	746	2,520,407	3.82	1,007	444	467	1,918	129	247,651	10.18
Portage		108,788		108,788	3.98		23	9	32	281	8,985	12.11
Scioto		6,426		6,426	3.73		3		3	234	702	9.15
Stark	24,400	693,830	6,058	724,288	2.48	8	194	42	244	237	57,913	12.51
Tuscarawas	49,303	1,443,755	80,198	1,573,256	4.01	687	256	154	1,097	184	201,597	7.80
Vinton	244,841	192,984		437,825	4.24	116	123	72	311	185	57,478	7.62
Washington	163,148	5,556		168,704	3.35		36	14	50	192	9,598	17.58
Wayne		128,800	75	128,875	4.25		21	10	31	295	9,145	14.09
Total Ohio	22,623,127	8,065,609	271,801	30,960,537	3.97	12,509	4,137	4,461	21,107	154	3,255,980	9.51

OKLAHOMA

Coal	114,989	19,160	788	134,937	$4.90	26	41	21	88	215	18,960	7.12
Craig	12,987	20,709	766	34,462	4.32		24	9	33	95	3,122	11.04
Haskell	235,528	2,303	1,687	239,518	4.98	103	80	43	226	199	44,953	5.33
Latimer	79,502	2,769		82,271	3.81	16	34	24	74	87	6,429	12.80
Le Flore	635,544	46,334	16	681,894	5.90	341	158	108	607	161	97,791	6.97
Muskogee	184,935			184,935	3.33		44	11	55	298	16,364	11.30
Okmulgee	739,578	28,072		767,650	4.58	474	38	104	616	162	99,844	7.69
Pittsburg	292,875	474	1,134	294,483	7.36	417	16	52	485	180	87,503	3.37
Rogers	495,385	60,347	3,903	559,635	4.29		153	73	226	250	56,570	9.89
Sequoyah	29,975			29,975	4.68		15	5	20	123	2,460	12.18
Tulsa	2,147	7,902		10,049	5.62	16	4	3	23	163	3,752	2.68
Wagoner	1,650	400		2,050	3.10		5		5	77	385	5.32
Total Oklahoma	2,825,095	188,470	8,294	3,021,859	5.04	1,393	612	453	2,458	178	438,133	6.90

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface: In strip pits	Surface: All others	Total			
PENNSYLVANIA (BITUMINOUS COAL)												
Allegheny	7,683,882	2,195,087	1,013,517	10,892,486	$4.80	7,777	863	1,613	10,253	164	1,682,408	6.47
Armstrong	3,320,089	277,503	8,796	3,606,388	4.37	2,862	486	545	3,893	143	555,788	6.49
Beaver	126,597	344,785	44	471,426	4.38	90	92	50	232	226	52,365	9.00
Bedford	289,515	63,745	----	353,260	5.55	501	73	74	648	121	78,207	4.52
Blair	173,487	152,378	320	326,185	3.99	108	88	41	237	127	30,116	10.83
Bradford	2,202	7,449	----	9,651	4.13	6	3	----	9	193	1,734	5.57
Butler	1,116,815	538,772	5,131	1,660,718	4.12	677	339	188	1,204	182	219,671	7.56
Cambria	9,104,826	640,966	1,221,393	10,967,185	5.85	13,214	514	2,636	16,364	154	2,525,745	4.34
Cameron	34,727	16,971	----	51,698	3.48	----	28	5	33	193	6,370	8.12
Centre	658,937	264,404	68	923,409	4.25	472	272	127	871	150	130,571	7.07
Clarion	2,045,318	816,578	848	2,862,744	3.82	749	733	380	1,862	172	319,575	8.96
Clearfield	5,471,810	295,029	37,473	5,804,312	4.63	3,052	1,608	922	5,582	152	846,720	6.86
Clinton	129,780	336,847	168	466,795	3.77	83	188	44	315	163	51,320	9.10
Elk	589,210	237,925	88	827,223	4.43	427	233	154	814	154	125,114	6.61
Fayette	6,560,871	1,269,538	1,600,413	9,430,822	5.07	9,376	289	1,338	11,003	168	1,850,006	5.10
Forest	----	4,791	----	4,791	4.68	4	----	2	6	220	1,320	3.63
Greene	8,638,722	179,651	36,157	8,854,530	5.16	7,717	116	1,616	9,449	174	1,640,016	5.40
Indiana	5,367,955	357,356	447,735	6,173,046	4.91	5,205	565	1,076	6,846	156	1,069,682	5.77
Jefferson	1,227,449	329,882	31,282	1,588,613	4.32	1,061	424	251	1,736	141	244,932	6.49
Lawrence	----	222,838	171	223,009	3.76	29	56	14	99	235	23,220	9.60
Lycoming	----	25,097	25	25,122	4.20	14	8	3	25	188	4,700	5.35
McKean	----	23,960	----	23,960	4.44	----	16	3	19	118	2,245	10.67
Mercer	140,659	280,479	1,246	422,384	4.38	126	66	43	235	228	53,618	7.88
Somerset	4,275,236	496,072	24,617	4,795,925	5.22	4,434	608	985	6,027	146	877,116	5.47
Tioga	84,228	63,996	916	149,140	5.47	135	26	30	191	140	26,778	5.57
Venango	114,089	166,474	546	281,109	4.24	8	57	14	79	245	19,322	14.55
Washington	10,894,412	796,488	536,951	12,227,851	5.33	11,516	749	2,115	14,380	161	2,318,976	5.27
Westmoreland	3,290,666	1,390,657	686,536	5,367,859	4.97	4,979	473	872	6,324	144	910,951	5.89
Other counties:												
Fulton and Huntingdon	305,261	113,971	3,730	422,962	5.73	340	135	56	531	144	76,672	5.52
Total Pennsylvania	71,646,743	11,909,689	5,658,171	89,214,603	5.01	74,962	9,108	15,197	99,267	159	15,745,258	5.67

SOUTH DAKOTA (LIGNITE)												
Total South Dakota	620	25,809		26,429	$3.47		15	2	17	250	4,245	6.23
TENNESSEE												
Anderson	847,164	13,864	5,183	866,211	$5.15	997		176	1,173	129	151,126	5.73
Bledsoe		5,400		5,400	3.83	21		1	22	138	3,030	1.78
Campbell	1,037,521	35,394	10,937	1,083,852	5.89	1,662	50	308	2,020	140	283,809	3.82
Claiborne	719,985	37,217	9,793	766,995	5.54	1,149	52	150	1,351	131	177,224	4.33
Cumberland		15,899		15,899	4.83	8	12	4	24	106	2,549	6.24
Fentress	129,132	16,332	1,302	146,766	4.88	211		37	248	136	33,682	4.36
Grundy	190,679	9,798	3,416	203,893	4.58	231	22	44	297	137	40,565	5.03
Hamilton	30,318	19,603	1,010	50,931	4.18	86		9	95	191	18,109	2.81
Marion	204,767	108,776	3,946	317,489	5.25	395	40	53	488	103	50,388	6.30
Morgan	235,313	35,797	5,000	276,110	5.05	519	23	103	645	223	143,757	1.92
Overton	21,202	3,185		24,387	3.86	31	5	8	44	119	5,233	4.66
Putnam	89,601	17,869	353	107,823	2.42	70		15	85	119	10,128	10.65
Roane	1,300	8,681		9,981	5.37	10		1	11	189	2,079	4.80
Scott	186,145	548	232	186,925	4.74	258	10	47	315	108	33,996	5.50
Sequatchie	49,378	37,888		87,266	4.60	80	39	8	127	123	15,680	5.57
Van Buren		12,913		12,913	3.29	21	22	2	45	93	4,194	3.08
White		9,431		9,431	3.59	25		7	32	118	3,770	2.50
Total Tennessee	3,742,505	388,595	41,172	4,172,272	5.25	5,774	275	973	7,022	139	979,319	4.26
TEXAS (LIGNITE)												
Total Texas	49,213		260	49,473	$1.02		10	6	16	223	3,560	13.90
UTAH												
Carbon	3,713,798	258,275	177,912	4,149,985	$4.94	2,389		906	3,295	191	630,519	6.58
Emery	1,732,251	133,662	13,731	1,879,644	4.41	1,109		299	1,408	201	282,609	6.65
Garfield		1,237		1,237	4.70	1			1	268	268	4.62
Grand	11,750		135	11,885	4.91	16		5	21	161	3,389	3.51
Iron		20,941		20,941	5.07	16		3	19	270	5,125	4.09
Kane		3,044		3,044	4.00	5			5	142	710	4.29
Sevier	26,920	37,805		64,725	4.47	26		12	38	247	9,403	6.88
Summit		25,731		25,731	3.55	14		5	19	254	4,824	5.33
Uintah		2,400		2,400	4.70	4			4	240	960	2.50
Total Utah	5,484,719	483,095	191,778	6,159,592	4.77	3,580		1,230	4,810	195	937,807	6.57

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface		Total			
							In strip pits	All others				
VIRGINIA												
Buchanan	4,369,072	40,006	15,400	4,424,478	$5.64	3,734	219	652	4,605	159	732,069	6.04
Dickenson	2,508,060	65,835	1,069	2,574,964	5.38	2,364		386	2,750	163	447,028	5.76
Lee	517,806	93,042	8,063	618,911	6.56	1,043		168	1,211	149	180,728	3.42
Montgomery	110,654	8,822	1,314	120,790	4.42	172		47	219	140	30,555	3.95
Russell	1,046,882	111,915	952	1,159,749	5.60	1,158	34	159	1,351	153	207,224	5.60
Scott		15,549		15,549	5.52	29		6	35	184	6,450	2.41
Tazewell	2,046,267	77,532	28,659	2,152,458	6.12	2,869	4	591	3,464	159	550,682	3.91
Wise	3,195,173	105,898	216,117	3,517,188	5.46	3,944	83	679	4,706	152	713,605	4.93
Total Virginia	13,793,914	518,599	271,574	14,584,087	5.65	15,313	340	2,688	18,341	156	2,868,341	5.08
WASHINGTON												
King	76,213	141,963	819	218,995	$6.80	199	32	76	307	186	57,093	3.84
Kittitas	427,377	16,222	15,074	458,673	6.74	397	28	156	581	213	124,004	3.70
Lewis		45,581		45,581	5.43	44		6	50	184	9,185	4.96
Pierce	5,755	2,637	145	8,537	7.09	14		3	17	147	2,495	3.42
Thurston	42,762	742	131	43,635	4.83	32	26	9	67	85	5,721	7.63
Whatcom	107,447	13,544	2,634	123,625	7.53	133		36	169	194	32,853	3.76
Total Washington	659,554	220,689	18,803	899,046	6.71	819	86	286	1,191	194	231,351	3.89

WEST VIRGINIA

Barbour	2,874,710	33,590	728	2,909,028	$4.09	1,408	302	556	2,266	141	320,226	9.08
Boone	4,376,371	11,679	12,378	4,400,428	5.08	3,802	137	960	4,899	152	744,868	5.91
Braxton	141,155	24,489	----------	165,644	3.70	43	22	14	79	185	14,609	11.34
Brooke	945,527	250,660	900,223	2,096,410	4.29	968	269	194	1,431	178	254,913	8.22
Clay	1,223,130	22,157	23,838	1,269,125	4.93	589	----------	206	795	273	217,343	5.84
Fayette	9,847,178	215,739	358,786	10,421,703	5.76	10,096	507	1,733	12,336	165	2,041,356	5.11
Gilmer	72,449	17,529	----------	89,978	3.69	84	----------	9	93	155	14,458	6.22
Grant	23,688	21,033	----------	44,721	4.77	92	6	11	109	122	13,352	3.35
Greenbrier	2,018,930	37,544	9,115	2,065,589	5.80	1,705	174	394	2,273	153	347,701	5.94
Hancock	106,415	7,803	931	115,149	4.15	----------	45	7	52	144	7,508	15.34
Harrison	8,592,056	93,255	10,106	8,695,417	4.24	3,589	965	1,031	5,585	140	783,303	11.10
Kanawha	6,686,176	183,457	26,774	6,896,407	5.23	6,415	133	1,015	7,563	155	1,170,692	5.89
Lewis	248,081	11,119	----------	259,200	3.56	7	44	16	67	247	16,529	15.68
Lincoln	20,470	----------	----------	20,470	5.24	57	----------	8	65	71	4,600	4.45
Logan	16,278,457	22,162	125,927	16,426,546	5.36	11,900	76	2,696	14,672	161	2,368,158	6.94
Marion	7,272,874	117,449	447,988	7,838,311	4.67	4,374	36	1,085	5,495	171	941,354	8.33
Marshall	403,215	47,538	658	451,411	4.67	570	----------	96	666	147	97,594	4.63
Mason	153,545	52,936	----------	206,481	3.85	235	----------	37	272	150	40,881	5.05
McDowell	16,130,179	50,644	328,049	16,508,872	6.18	15,982	453	3,957	20,392	162	3,304,969	5.00
Mercer	2,319,643	25,434	21,181	2,366,258	5.97	2,065	357	663	3,085	157	485,769	4.87
Mineral	77,003	23,975	1,822	102,800	5.85	88	18	22	128	149	19,018	5.41
Mingo	4,378,739	25,613	32,303	4,436,655	5.31	4,235	213	944	5,392	142	763,209	5.81
Monongalia	7,834,088	388,183	5,099	8,227,370	4.38	4,787	179	1,048	6,014	143	857,189	9.60
Nicholas	2,696,438	59,804	3,349	2,759,591	5.54	2,673	163	521	3,357	156	523,526	5.27
Ohio	932,660	95,361	5,273	1,033,294	4.62	1,065	----------	157	1,222	156	190,928	5.41
Pocahontas	9,166	----------	----------	9,166	5.96	13	----------	4	17	81	1,377	6.66
Preston	2,331,629	68,167	181,041	2,580,837	4.60	2,238	118	379	2,735	205	561,533	4.60
Putnam	1,595	4,137	5,676	11,408	4.59	9	12	6	27	59	1,587	7.19
Raleigh	9,546,010	54,626	107,391	9,708,027	6.06	10,366	306	2,010	12,682	162	2,050,054	4.74
Randolph	1,233,133	26,530	4,299	1,263,962	5.35	1,133	147	269	1,549	144	222,754	5.67
Taylor	710,314	11,586	----------	721,900	3.97	255	136	77	468	140	65,497	11.02
Tucker	275,106	4,316	1,287	280,709	5.29	281	63	46	390	115	44,959	6.24
Upshur	1,166,516	7,223	798	1,174,537	3.67	489	125	154	768	155	119,054	9.87
Wayne	290,081	1,415	----------	291,496	4.70	309	----------	50	359	126	45,310	6.43
Webster	1,396,107	24,383	7,127	1,427,617	5.94	1,244	32	338	1,614	160	258,204	5.53
Wyoming	5,268,755	30,756	34,550	5,334,061	6.12	4,750	153	930	5,833	166	967,255	5.51
Total West Virginia	117,881,589	2,072,292	2,656,697	122,610,578	5.30	97,916	5,191	21,643	124,750	159	19,881,637	6.17

See footnotes at end of table.

TABLE 34.—Production, value, employment, days active, man-days, and output per man per day at bituminous-coal and lignite mines in the United States, by States and counties, in 1949—Continued

[Exclusive of mines producing less than 1,000 tons]

County	Production (net tons)				Average value per ton [3]	Average number of men working daily				Average number of days mines were active	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total		Underground	Surface		Total			
							In strip pits	All others				
WYOMING												
Campbell	270,528	30,832	14,336	315,696	$1.41	----	23	26	49	264	12,930	24.42
Carbon	859,310	6,408	29,929	895,647	3.96	267	49	131	447	188	84,137	10.65
Converse	----	11,167	140	11,307	3.38	----	8	----	8	175	1,403	8.06
Fremont	----	8,562	100	8,662	4.63	11	----	4	15	220	3,298	2.63
Hot Springs	30,803	17,615	10	48,428	6.35	55	----	25	80	130	10,424	4.65
Johnson	----	3,277	300	3,577	3.66	3	----	1	4	253	1,012	3.53
Lincoln	273,843	7,618	2,695	284,156	4.20	207	----	62	269	114	30,748	9.24
Sheridan	1,094,313	52,220	1,382	1,147,915	2.89	305	81	137	523	218	113,777	10.09
Sweetwater	3,193,110	9,341	80,974	3,283,425	4.28	1,987	----	469	2,456	194	476,357	6.89
Uinta	----	2,111	----	2,111	3.20	5	----	----	5	137	687	3.07
Total Wyoming	5,721,907	149,151	129,866	6,000,924	3.83	2,840	161	855	3,856	191	734,773	8.17
OTHER STATES												
Total Georgia and North Carolina	4,100	26,146	----	30,246	$6.70	88	----	16	104	249	25,875	1.17
UNITED STATES												
Total United States	378,430,302	47,786,511	11,651,223	437,868,036	$4.88	326,758	29,267	77,673	433,698	157	68,129,897	6.43

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by truck to railroad siding, and hauled by truck to waterway.

[2] Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, transported to point of use by conveyor or tram, made into beehive coke at mine, and all other uses.

[3] Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked [not coke] as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

[4] In certain counties the average tons per man per day is large due to strip mining or mechanical loading underground.

TRANSPORTATION [11]

TABLE 35.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, as reported by mine operators, in 1949 [1]

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD			
Alabama Central	Alabama	57,965	57,965
Alaska	Alaska	422,977	422,977
Algers, Winslow & Western	Indiana	1,822,206	1,822,206
Alton	Illinois	41,824	41,824
Artemus-Jellico	Kentucky	172,089	172,089
Atchison, Topeka & Santa Fe	Colorado	209,973	1,306,786
	Illinois	461,059	
	Kansas	7,975	
	New Mexico	627,779	
Baltimore & Ohio	Illinois	193,083	34,808,187
	Indiana	374,751	
	Maryland	23,870	
	Ohio	3,675,847	
	Pennsylvania	7,506,705	
	West Virginia	23,033,931	
Bessemer & Lake Erie	Pennsylvania	2,778,318	2,778,318
Bevier & Southern	Missouri	757,618	757,618
Brimstone	Tennessee	91,279	91,279
Buffalo Creek & Gauley	West Virginia	1,043,055	1,043,055
Cambria & Indiana	Pennsylvania	2,189,612	2,189,612
Campbell's Creek	West Virginia	460,364	460,364
Carbon County	Utah	1,358,793	1,358,793
Central of Georgia	Alabama	542,954	547,054
	Georgia	4,100	
Chesapeake & Ohio	Kentucky	9,120,449	48,333,425
	Ohio	633,550	
	Virginia	242,456	
	West Virginia	38,336,970	
Cheswick & Harmar	Pennsylvania	648,373	648,373
Chicago, Burlington & Quincy	Colorado	22,669	7,568,738
	Illinois	5,933,505	
	Iowa	216,920	
	Wyoming	1,395,644	
Chicago & Eastern Illinois	Illinois	730,818	1,632,195
	Indiana	901,377	
Chicago & Illinois Midland	Illinois	5,128,861	5,128,861
Chicago, Indianapolis & Louisville	Indiana	271,398	271,398
Chicago Milwaukee, St. Paul & Pacific	Indiana	4,298,704	5,018,985
	Iowa	71,104	
	Montana (bituminous)	613,635	
	North Dakota (lignite)	34,922	
	South Dakota (lignite)	620	
Chicago & North Western	Illinois	2,921,280	2,921,280
Chicago, Rock Island & Pacific	Arkansas	11,724	973,065
	Illinois	518,799	
	Iowa	143,886	
	Missouri	204,060	
	Oklahoma	94,596	
Clinchfield	Kentucky	192,185	3,906,981
	Virginia	3,714,796	
Colorado & Southeastern	Colorado	87,162	87,162
Colorado & Southern	do	199,466	199,466
Colorado & Wyoming	do	459,479	459,479
Conemaugh & Black Lick	Pennsylvania	80,689	80,689
Cumberland & Pennsylvania	Maryland	111,217	111,217
Dardanelle & Russellville Ry. Co	Arkansas	35,479	35,479
Denver & Intermountain	Colorado	74,391	74,391
Denver & Rio Grande Western	Colorado	1,765,859	4,402,767
	New Mexico	27,466	
	Utah	2,609,442	
Detroit, Toledo & Ironton	Ohio	8,710	8,710
East Broad Top R. R. & Coal Co	Pennsylvania	384,509	384,509
Erie	Ohio	161,162	795,471
	Pennsylvania	634,309	
Fort Smith & Van Buren	Oklahoma	170,391	170,391
Galesburg & Great Eastern	Illinois	361,256	361,256
Great Northern	Montana (bituminous)	1,174	702,267
	North Dakota (lignite)	593,646	
	Washington	107,447	

See footnotes at end of table.

[11] Tonnages hauled by various methods of transportation and by States in 1949 are reported in table 10 and, for lignite alone, in table 43. Average railroad freight charges in 1949-50 are included in table 1.

TABLE 35.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, as reported by mine operators, in 1949 [1]—Con.

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD—continued			
Gulf, Mobile & Ohio	Alabama	133,451	1,196,429
	Illinois	1,062,978	
Huntingdon & Broad Top Mountain R. R. & Coal Co.	Pennsylvania	212,469	212,469
Illinois Central	Alabama	135,320	19,733,088
	Illinois	8,868,493	
	Indiana	193,970	
	Kentucky	10,535,305	
Illinois Terminal	Illinois	310,792	310,792
Interstate	Kentucky	158,818	1,934,469
	Virginia	1,775,651	
Johnstown & Stony Creek	Pennsylvania	147,969	147,969
Joplin-Pittsburg	Kansas	134,336	134,336
Kanawha Central	West Virginia	107,614	107,614
Kansas City Southern	Kansas	277,581	1,532,973
	Missouri	738,196	
	Oklahoma	517,196	
Kelley's Creek & Northwestern	West Virginia	856,830	856,830
Kentucky & Tennessee	Kentucky	335,985	335,985
Lake Erie, Franklin & Clarion	Pennsylvania	455,623	455,623
Laramie, North Park & Western	Colorado	2,502	2,502
Ligonier Valley	Pennsylvania	22,606	22,606
Litchfield & Madison	Illinois	558,711	558,711
Louisville & Nashville	Alabama	3,059,910	29,156,587
	Illinois	45,091	
	Kentucky	25,055,023	
	Tennessee	763,318	
	Virginia	233,245	
Mary Lee	Alabama	425,458	425,458
Midland Valley	Arkansas	158,939	532,234
	Oklahoma	373,295	
Minneapolis & St. Louis	Illinois	919,450	933,312
	Iowa	13,862	
Minneapolis, St. Paul & Sault Ste. Marie	North Dakota (lignite)	616,686	616,686
Missouri-Illinois	Illinois	35,666	35,666
Missouri-Kansas-Texas	Kansas	329,444	703,098
	Missouri	94,223	
	Oklahoma	279,431	
Missouri Pacific	Arkansas	456,649	5,967,268
	Illinois	4,445,202	
	Kansas	768,333	
	Missouri	69,278	
	Oklahoma	227,806	
Monongahela	Pennsylvania	1,922,821	9,754,642
	West Virginia	7,831,821	
Montana, Wyoming & Southern	Montana (bituminous)	205,666	205,666
Montour	Pennsylvania	3,242,621	3,242,621
Nashville, Chattanooga & St. Louis	Tennessee	438,178	438,178
New York Central (includes coal shipped over Kanawha & Michigan, Kelley's Creek, Toledo and Ohio Central, and Zanesville & Western)	Illinois	4,789,929	18,253,139
	Indiana	2,392,389	
	Ohio	4,876,501	
	Pennsylvania	4,908,833	
	West Virginia	1,285,487	
Nicholas, Fayette & Greenbrier	West Virginia	1,344,215	1,344,215
Norfolk & Western	Kentucky	4,782,173	34,950,861
	Virginia	7,144,422	
	West Virginia	23,024,266	
Northeast Oklahoma	Kansas	5,726	5,726
Northern Pacific	Montana (bituminous)	1,817,249	3,413,847
	North Dakota (lignite)	1,120,791	
	Washington	475,807	
Oklahoma City-Ada-Atoka	Oklahoma	114,989	114,989
Oneida & Western	Tennessee	5,441	5,441
Pacific Coast	Washington	33,538	33,538
Pennsylvania (includes Pittsburgh, Cincinnati, Chicago & St. Louis)	Illinois	49,448	36,258,560
	Indiana	3,519,631	
	Ohio	6,141,867	
	Pennsylvania	25,851,058	
	West Virginia	696,556	
Peoria Terminal	Illinois	264,629	264,629
Pittsburgh & Lake Erie	Pennsylvania	1,064,975	1,064,975
Pittsburg & Shawmut	Pennsylvania	1,787,691	1,787,691
Pittsburgh, Chartiers & Youghiogheny	Pennsylvania	28,668	28,668
Pittsburgh & West Virginia	Ohio	204,507	1,114,082
	Pennsylvania	402,748	
	West Virginia	506,827	

See footnotes at end of table.

TABLE 35.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, as reported by mine operators, in 1949 [1]—Con.

Route	State	Net tons: By State	Net tons: Total for route
RAILROAD—continued			
Preston	West Virginia	66,681	66,681
Rockdale, Sandow & Southern	Texas (lignite)	49,213	49,213
St. Louis & O'Fallon	Illinois	318,623	318,623
St. Louis-San Francisco	Alabama	1,261,364	3,594,506
	Arkansas	277,269	
	Kansas	358,205	
	Missouri	650,277	
	Oklahoma	1,047,391	
Southern	Alabama	1,574,786	5,192,538
	Illinois	3,984	
	Indiana	994,798	
	Kentucky	639,670	
	Tennessee	1,406,610	
	Virginia	572,690	
Southern Iowa	Iowa	27,822	27,822
Southern Pacific	New Mexico	271,177	271,177
Springfield Terminal	Illinois	400,805	400,805
Tennessee	Tennessee	715,435	715,435
Tennessee Central	Tennessee	234,494	234,494
Tennessee Coal, Iron & Railroad Co.	Alabama	2,734,545	2,734,545
Thomas & Sayreton	Alabama	346,085	346,085
Toledo, Peoria & Western	Illinois	18,741	18,741
Union	Pennsylvania	50,482	50,482
Union Pacific	Colorado	537,265	4,906,290
	Washington	42,762	
	Wyoming	4,326,263	
Unity	Pennsylvania	464,406	464,406
Utah	Utah	1,516,484	1,516,484
Virginian	Virginia	110,654	10,956,247
	West Virginia	10,845,593	
Wabash	Illinois	1,011,530	1,715,809
	Iowa	275,780	
	Missouri	428,499	
West Virginia Northern	West Virginia	1,583,996	1,583,996
Western Allegheny	Pennsylvania	171,436	171,436
Western Maryland	Maryland	327,955	4,066,533
	Pennsylvania	418,428	
	West Virginia	3,320,150	
Wheeling & Lake Erie	Ohio	6,026,182	6,026,182
Winifrede	West Virginia	140,183	140,183
Woodward Iron Co.	Alabama	695,466	695,466
Youngstown & Southern	Ohio	8,784	8,784
Total railroad shipments		356,601,818	356,601,818
WATERWAY			
Allegheny River	Pennsylvania	1,109,361	1,109,361
Black Warrior River	Alabama	13,620	13,620
Emory River	Tennessee	81,104	81,104
Illinois River	Illinois	879,122	879,122
Kanawha River	West Virginia	1,811,007	1,811,007
Monongahela River	Pennsylvania	15,107,136	16,153,327
	West Virginia	1,046,191	
Ohio River	Kentucky	293,531	1,719,400
	Ohio	886,017	
	West Virginia	539,852	
Tennessee River	Tennessee	6,646	6,646
Youghiogheny River	Pennsylvania	54,897	54,897
Total waterway shipments		21,828,484	21,828,484
Total loaded at mines for shipment by railroads and waterways.		378,430,302	378,430,302
Shipped by truck		47,786,511	47,786,511
Used at mine [2]		11,651,223	11,651,223
Total production 1949		437,868,036	437,868,036

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by truck to railroad siding and hauled by truck to waterway. In general, figures show the quantity of bituminous coal and lignite originated for each railroad and waterway as reported by mine operators. It must be noted that in one year an operator may report coal loaded on the subsidiary railroad and in another year the same operator may report coal loaded on the parent railroad system.

[2] Includes coal used by mine employees, taken by locomotive tenders at tipple, used at mine for power and heat, coal transported from mine to point of use by conveyor or tram, coal made into beehive coke at mine, and all other uses at mine.

CONSUMPTION

TABLE 36.—Consumption of bituminous coal and lignite, by consumer class, with retail deliveries in the United States, 1933–50, in thousands of net tons

Year	Electric power utilities [1]	Bunker foreign trade [2]	Railroads [3] (class I)	Coke plants		Steel and rolling mills	Cement mills [4]	Other industrial [5]	Retail deliveries [5]	Total of classes shown [6]
				Beehive	Oven					
1933	27,088	1,316	72,548	1,408	38,681	10,009	2,832	83,321	80,482	317,685
1934	29,707	1,321	76,037	1,635	44,343	10,898	3,500	89,448	86,925	343,814
1935	30,936	1,576	77,109	1,469	49,046	11,747	3,516	96,937	83,990	356,326
1936	38,104	1,622	86,391	2,698	63,244	13,471	4,771	113,792	84,200	408,293
1937	41,045	1,832	88,080	4,927	69,575	12,853	5,247	127,142	80,076	430,777
1938	36,440	1,352	73,921	1,360	45,266	8,412	4,483	96,527	68,520	336,281
1939	42,304	1,477	79,072	2,298	61,216	9,808	5,274	103,079	71,570	376,098
1940	49,126	1,426	85,130	4,803	76,583	10,040	5,633	110,469	87,700	430,910
1941	59,888	1,643	97,384	10,529	82,609	10,902	6,832	124,868	97,460	492,115
1942	63,472	1,585	115,410	12,876	87,974	10,434	7,570	135,979	104,750	540,050
1943	74,036	1,647	130,283	12,441	90,019	11,238	5,851	145,518	122,764	593,797
1944	76,656	1,559	132,049	10,858	94,438	10,734	3,789	134,610	124,906	589,599
1945	71,603	1,785	125,120	8,135	87,214	10,084	4,215	129,606	121,805	559,567
1946	68,743	1,381	110,166	7,167	76,121	8,603	7,009	120,610	100,586	500,386
1947	86,009	1,689	109,296	10,475	94,325	10,048	7,938	126,948	99,163	545,891
1948	95,620	1,057	94,838	10,322	96,984	10,046	8,554	112,741	89,747	519,909
1949	80,610	874	68,123	5,354	85,882	7,451	7,988	98,957	90,299	445,538
1950 [7]	88,261	717	60,969	8,845	94,651	7,698	7,921	98,164	86,604	453,830

[1] Federal Power Commission. Represents latest available revised figures for bituminous coal and lignite consumed by public-utility power plants in power generation, including a small quantity of coke amounting to approximately 100,000 tons annually.
[2] U. S. Department of Commerce.
[3] Association of American Railroads. Represents consumption of bituminous coal and lignite by class I railways for all uses, including locomotive, powerhouse, shop, and station fuel. The Interstate Commerce Commission reports that in 1949 consumption for all uses by class I line-haul railways, plus purchases of class II and class III railways, plus purchases by all switching terminal companies combined was 71,492,131 tons of bituminous coal and lignite.
[4] Includes a small amount of anthracite.
[5] Estimates based upon reports collected from a selected list of representative manufacturing plants and retailers.
[6] The total of classes shown approximates total consumption. It is not possible to calculate consumption closely from production, imports, exports and changes in stocks because certain significant items of stocks are not included in year-end stocks. These items are: Stocks on Lake and Tidewater docks, stocks at other intermediate storage piles between mine and consumer, and coal in transit.
[7] Preliminary figures.

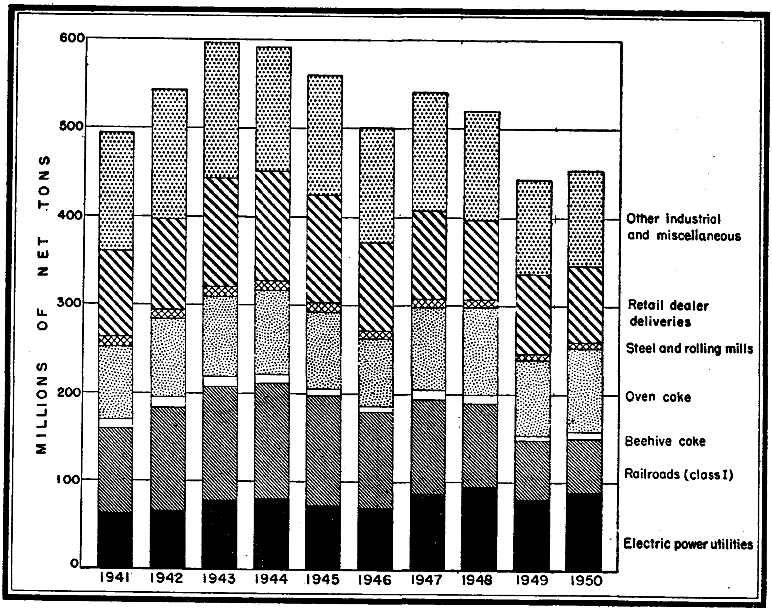

FIGURE 6.—Consumption of bituminous coal and lignite, by consumer class, with retail dealer deliveries in the United States, 1941–50.

TABLE 37.—Fuel economy in consumption of coal at electric-utility power plants in the United States, 1919–50

Year	Pounds of coal per kilowatt-hour	Economy gain over 1919 (percent)	Year	Pounds of coal per kilowatt-hour	Economy gain over 1919 (percent)	Year	Pounds of coal per kilowatt-hour	Economy gain over 1919 (percent)
1919	3.20	----------	1930	1.60	50.0	1941	1.34	58.1
1920	3.00	6.2	1931	1.52	52.5	1942	1.30	59.4
1921	2.70	15.6	1932	1.49	53.4	1943	1.30	59.4
1922	2.50	21.9	1933	1.46	54.4	1944	1.29	59.7
1923	2.40	25.0	1934	1.45	54.7	1945	1.30	59.4
1924	2.20	31.3	1935	1.44	55.0	1946	1.29	59.7
1925	2.00	37.5	1936	1.44	55.0	1947	1.31	59.1
1926	1.90	40.6	1937	1.44	55.0	1948	1.30	59.4
1927	1.82	43.1	1938	1.40	56.2	1949	1.24	61.2
1928	1.73	45.9	1939	1.38	56.9	1950	1.19	62.8
1929	1.66	48.1	1940	1.34	58.1			

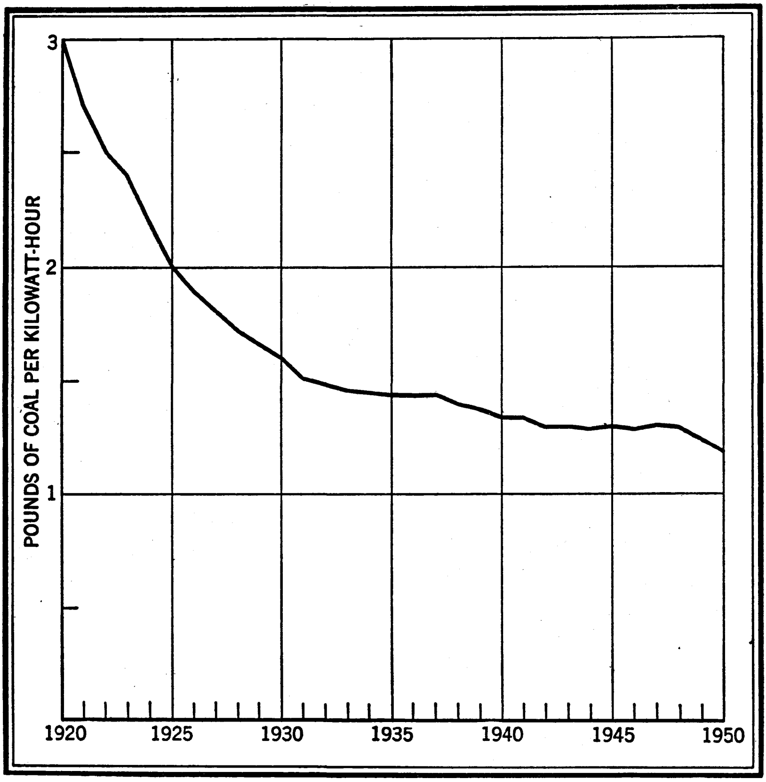

FIGURE 7.—Trend in fuel economy at electric-utility power plants in the United States, 1920–50.

RELATIVE RATE OF GROWTH OF COAL, PETROLEUM, GAS, AND WATER POWER

The total supply of available energy in the form of coal, oil, natural gas, and water power in 1950 was 35,137 trillion B. t. u.—an 11.5-percent increase over 1949.

The figures are expressed in British thermal units because some common denominator is necessary for such unlike quantities as tons of coal, barrels of oil, and cubic feet of gas. Table 38 summarizes the equivalent of each of the fuels in trillions of British thermal units. Water power is represented by the equivalent fuel required to perform the same work. The table covers 1889 and 1899 to 1950.

In converting water power to its equivalent of fuel required to perform the same work, the *prevailing* or average performance of all fuel-burning central electric stations for each year in question has been used. This average has declined from about 7.05 pounds of coal per kilowatt-hour in 1899 to 1.19 in 1950, which shows the influence of improving fuel efficiency. The *prevailing* fuel equivalent closely approximates the quantity of fuel that would have been needed in any one year to generate the same power in a steam-electric station. It should be noted, however, that the ultimate use of the water power generated often displaces fuel burned much less efficiently than in central stations and that no other important branch of fuel consumption has made advances in fuel efficiency approaching that of the central stations. As these tables attempt to determine the total energy from all fuels and from water power, the ideal factor for converting water power into fuel equivalent would be the average efficiency of all forms of fuel consumption in each year. No basis for determining such an all-embracing average exists at present, but enough is known to make certain that it would show much less reduction from 1899 to 1950 than do the central stations.

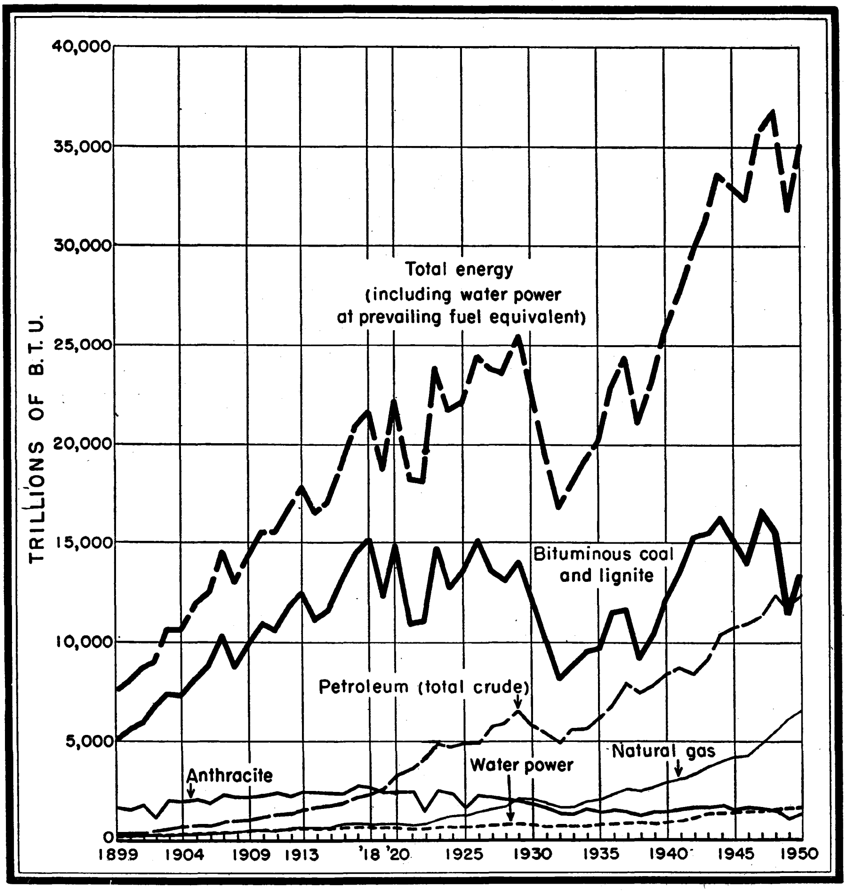

FIGURE 8.—Annual supply of energy from mineral fuels and water power in the United States, 1899–1950

The figures for oil represent production of crude petroleum and imports; the figures for natural gas represent marketed production. Most of this production does not come into direct competition with coal. Much of the supply of both oil and gas is used in regions of the country, such as California and portions of the Southwest, where coal is available only at unusually high cost because of high transportation charges. About one-third of the natural gas is used in the field for drilling or operating oil and gas wells and pipelines or for the manufacture of carbon black. More than half of the oil is used in the form of gasoline, kerosine, and lubricants, for which purposes coal cannot well compete, except at very much higher levels of oil prices. Even these refined products, however, involve a certain measure of indirect competition with coal, for the energy market of the country is becoming more fluid and competitive, and a demand that cannot be met by one source of supply tends to fall back on the others.

The subject of interfuel competition is exceedingly complex, and an elaborate analysis and the accumulation of data not now available would be required to determine even approximately how much of any one fuel actually has been displaced either by other fuels or by water power. The present tables do not permit determination of such displacement; their purpose is rather to measure the long-time trends in the total demand for energy.

An exploratory study concerned with interfuel competition and including a projection of 1965 energy requirements and supplies, by commodities, was published by the Bureau of Mines.[12]

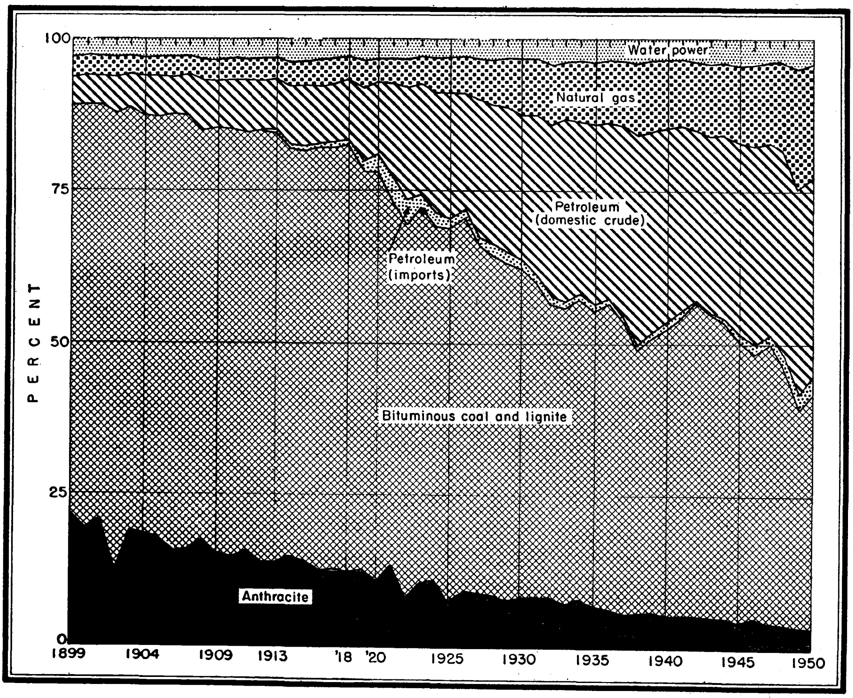

FIGURE 9.—Percentage of total British thermal unit equivalent contributed by the several sources of energy in the United States, counting water power at the prevailing fuel equivalent of central stations in each year, 1899–1950.

[12] Barnett, Harold J., Energy Uses and Supplies, 1939, 1947, 1965: Bureau of Mines Inf. Circ. 7582, 1950, 53 pp.

TABLE 38.—Annual supply of energy from mineral fuels and water power in the United States, 1889 and 1899–1950, in trillions of British thermal units [1]

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude): Domestic production	Petroleum (crude): Imports	Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Water power [2]	Grand total
1889	1,157	2,507	3,664	204	--------	268	472	4,136	(3)	(3)
1899	1,535	5,065	6,600	331	--------	240	571	7,171	238	7,409
1900	1,457	5,563	7,020	369	--------	254	623	7,643	250	7,893
1901	1,714	5,917	7,631	402	--------	283	685	8,316	264	8,580
1902	1,051	6,818	7,869	515	--------	301	816	8,685	289	8,974
1903	1,895	7,408	9,303	583	--------	319	902	10,205	321	10,526
1904	1,858	7,301	9,159	679	--------	333	1,012	10,171	354	10,525
1905	1,973	8,255	10,228	781	--------	377	1,158	11,386	386	11,772
1906	1,811	8,983	10,794	734	--------	418	1,152	11,946	414	12,360
1907	2,174	10,343	12,517	963	--------	437	1,400	13,917	441	14,358
1908	2,115	8,713	10,828	1,035	--------	432	1,467	12,295	476	12,771
1909	2,059	9,949	12,008	1,062	--------	517	1,579	13,587	513	14,100
1910	2,146	10,928	13,074	1,215	3	547	1,765	14,839	539	15,378
1911	2,298	10,635	12,933	1,279	8	551	1,838	14,771	565	15,336
1912	2,143	11,793	13,936	1,293	40	604	1,937	15,873	585	16,458
1913	2,325	12,535	14,860	1,441	98	626	2,165	17,025	609	17,634
1914	2,307	11,075	13,382	1,541	98	636	2,275	15,657	636	16,293
1915	2,260	11,597	13,857	1,630	105	676	2,411	16,268	659	16,927
1916	2,224	13,166	15,390	1,744	121	810	2,675	18,065	681	18,746
1917	2,530	14,457	16,987	1,945	175	855	2,975	19,962	700	20,662
1918	2,510	15,180	17,690	2,064	219	775	3,058	20,748	701	21,449
1919	2,238	12,206	14,444	2,195	306	802	3,303	17,747	718	18,465
1920	2,276	14,899	17,175	2,569	616	858	4,043	21,218	738	21,956
1921	2,298	10,897	13,195	2,739	727	712	4,178	17,373	620	17,993
1922	1,389	11,063	12,452	3,234	738	820	4,792	17,244	643	17,887
1923	2,371	14,792	17,163	4,248	476	1,083	5,807	22,970	685	23,655
1924	2,233	12,672	14,905	4,141	451	1,228	5,820	20,725	648	21,373
1925	1,570	13,625	15,195	4,430	359	1,278	6,067	21,262	668	21,930
1926	2,145	15,022	17,167	4,471	350	1,411	6,232	23,399	728	24,127
1927	2,034	13,565	15,599	5,227	339	1,553	7,119	22,718	776	23,494
1928	1,914	13,120	15,034	5,229	463	1,686	7,378	22,412	854	23,266
1929	1,875	14,017	15,892	5,842	458	2,062	8,362	24,254	816	25,070
1930	1,762	12,249	14,011	5,208	360	2,089	7,657	21,668	752	22,420
1931	1,515	10,011	11,526	4,936	274	1,813	7,023	18,549	668	19,217
1932	1,266	8,114	9,380	4,554	259	1,673	6,486	15,866	713	16,579
1933	1,258	8,741	9,999	5,253	185	1,672	7,110	17,109	711	17,820
1934	1,452	9,415	10,867	5,267	206	1,904	7,377	18,244	698	18,942
1935	1,325	9,756	11,081	5,780	187	2,060	8,027	19,108	806	19,914
1936	1,386	11,504	12,890	6,378	187	2,330	8,895	21,785	812	22,597
1937	1,317	11,673	12,990	7,419	159	2,588	10,166	23,156	871	24,027
1938	1,171	9,132	10,303	7,043	153	2,468	9,664	19,967	866	20,833
1939	1,308	10,345	11,653	7,337	192	2,663	10,192	21,845	838	22,683
1940	1,308	12,072	13,380	7,849	247	2,860	10,956	24,336	880	25,216
1941	1,432	13,471	14,903	8,133	294	3,024	11,451	26,354	934	27,288
1942	1,532	15,267	16,799	8,043	71	3,282	11,396	28,195	1,136	29,331
1943	1,540	15,463	17,003	8,733	80	3,671	12,484	29,487	1,304	30,791
1944	1,618	16,233	17,851	9,732	260	3,989	13,981	31,832	1,344	33,176
1945	1,395	15,134	16,529	9,939	429	4,213	14,581	31,110	1,442	32,552
1946	1,537	13,989	15,526	10,057	517	4,333	14,907	30,433	1,406	31,839
1947	1,453	16,522	17,975	10,771	576	4,926	16,273	34,248	1,426	35,674
1948	1,451	15,707	17,158	11,717	746	5,534	17,997	35,155	1,481	36,636
1949 [4]	1,085	11,472	12,557	10,683	897	5,827	17,407	29,967	1,539	31,503
1950 [4]	1,128	13,414	14,542	11,438	1,002	6,583	19,023	33,565	1,572	35,137

[1] The unit heat values employed are: Anthracite, 12,700 B. t. u. per pound; bituminous coal and lignite, 13,100 B. t. u. per pound; petroleum, 5,800,000 B. t. u. per barrel; natural gas, 1,075 B. t. u. per cubic foot. Water power includes installations owned by manufacturing plants and mines, as well as Government- and privately-owned public utilities. The fuel equivalent of water power is calculated from the kilowatt-hours of power produced wherever available, as it is true of all public-utility plants since 1919. Otherwise, the fuel equivalent is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 percent for factories and mines and of 40 percent for public utilities.

[2] Fuel equivalent calculated by assuming the average central-station practice for each of the years for which data are available.

[3] Data not available.

[4] Preliminary figures.

TABLE 39.—Index numbers for relative rate of growth of coal, oil, and water power in the United States, 1889 and 1899–1950

(1918=100)

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude)		Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Water power	Grand total
				Domestic production	Imports					
1889	46	17	21	10	---------	35	15	20	(1)	(1)
1899	61	33	37	16	---------	31	19	35	34	35
1900	58	37	40	18	---------	33	20	37	36	37
1901	68	39	43	19	---------	37	22	40	38	40
1902	42	45	44	25	---------	39	27	42	41	42
1903	75	49	53	28	---------	41	29	49	46	49
1904	74	48	52	33	---------	43	33	49	50	49
1905	79	54	58	38	---------	49	38	55	55	55
1906	72	59	61	36	---------	54	38	58	59	58
1907	87	68	71	47	---------	56	46	67	63	67
1908	84	57	61	50	---------	56	48	59	68	60
1909	82	66	68	51	---------	67	52	65	73	66
1910	85	72	74	59	1	71	58	72	77	72
1911	92	70	73	62	4	71	60	71	81	71
1912	85	78	79	63	18	78	63	77	83	77
1913	93	83	84	70	45	81	71	82	87	82
1914	92	73	76	75	45	82	74	75	91	76
1915	90	76	78	79	48	87	79	78	94	79
1916	89	87	87	84	55	105	87	87	97	87
1917	101	95	96	94	80	110	97	96	100	96
1918	100	100	100	100	100	100	100	100	100	100
1919	89	80	82	106	140	103	108	86	102	86
1920	91	98	97	124	281	111	132	102	105	102
1921	92	72	75	133	332	92	137	84	88	84
1922	55	73	70	157	337	106	157	83	92	83
1923	94	97	97	206	217	140	190	111	98	110
1924	89	83	84	201	206	158	190	100	92	100
1925	63	90	86	215	164	165	198	102	95	102
1926	85	99	97	217	160	182	204	113	104	112
1927	81	89	88	253	155	201	233	109	111	110
1928	76	86	85	253	211	218	241	108	122	108
1929	75	92	90	283	209	266	273	117	116	117
1930	70	81	79	252	164	270	250	104	107	105
1931	60	66	65	239	125	234	230	89	95	90
1932	50	53	53	221	118	216	212	77	102	77
1933	50	57	57	255	84	216	233	82	101	83
1934	58	62	61	255	94	246	241	88	100	88
1935	53	64	63	280	85	266	262	92	115	93
1936	55	76	73	309	85	301	291	105	116	105
1937	52	77	73	359	73	334	332	112	124	112
1938	47	60	58	341	70	318	316	96	124	97
1939	52	68	66	355	88	344	333	105	120	106
1940	52	80	76	380	113	369	358	117	126	118
1941	57	89	84	394	134	390	374	127	133	127
1942	61	101	95	390	32	423	373	136	162	137
1943	61	102	96	423	37	474	408	142	186	144
1944	64	107	101	472	119	515	457	153	192	155
1945	56	100	93	482	196	544	477	150	206	152
1946	61	92	88	487	236	559	487	147	201	148
1947	58	109	102	522	263	636	532	165	203	166
1948	58	103	97	568	341	714	589	169	211	171
1949 [2]	43	76	71	518	410	752	569	144	220	147
1950 [2]	45	88	82	554	458	849	622	162	224	164

[1] Data not available.
[2] Preliminary figures.

TABLE 40.—Percentage of total British thermal unit equivalent contributed by the several mineral fuels and water power in the United States, 1899–1950 [1]

Year	Pennsylvania anthracite	Bituminous coal and lignite	Total coal	Petroleum (crude)		Natural gas (marketed production)	Total petroleum and natural gas	Total mineral fuels	Water power	Grand total
				Domestic production	Imports					
1899	20.7	68.4	89.1	4.5	--------	3.2	7.7	96.8	3.2	100.0
1900	18.4	70.5	88.9	4.7	--------	3.2	7.9	96.8	3.2	100.0
1901	20.0	68.9	88.9	4.7	--------	3.3	8.0	96.9	3.1	100.0
1902	11.7	76.0	87.7	5.7	--------	3.4	9.1	96.8	3.2	100.0
1903	18.0	70.4	88.4	5.6	--------	3.0	8.6	97.0	3.0	100.0
1904	17.6	69.4	87.0	6.4	--------	3.2	9.6	96.6	3.4	100.0
1905	16.8	70.1	86.9	6.6	--------	3.2	9.8	96.7	3.3	100.0
1906	14.7	72.7	87.4	5.9	--------	3.4	9.3	96.7	3.3	100.0
1907	15.2	72.0	87.2	6.7	--------	3.0	9.7	96.9	3.1	100.0
1908	16.6	68.2	84.8	8.1	--------	3.4	11.5	96.3	3.7	100.0
1909	14.6	70.6	85.2	7.5	--------	3.7	11.2	96.4	3.6	100.0
1910	13.9	71.1	85.0	7.9	--------	3.6	11.5	96.5	3.5	100.0
1911	15.0	69.3	84.3	8.3	0.1	3.6	12.0	96.3	3.7	100.0
1912	13.0	71.7	84.7	7.8	.2	3.7	11.7	96.4	3.6	100.0
1913	13.2	71.0	84.2	8.2	.6	3.5	12.3	96.5	3.5	100.0
1914	14.1	68.0	82.1	9.5	.6	3.9	14.0	96.1	3.9	100.0
1915	13.4	68.5	81.9	9.6	.6	4.0	14.2	96.1	3.9	100.0
1916	11.9	70.2	82.1	9.3	.7	4.3	14.3	96.4	3.6	100.0
1917	12.2	70.0	82.2	9.4	.9	4.1	14.4	96.6	3.4	100.0
1918	11.7	70.8	82.5	9.6	1.0	3.6	14.2	96.7	3.3	100.0
1919	12.1	66.1	78.2	11.9	1.7	4.3	17.9	96.1	3.9	100.0
1920	10.4	67.8	78.2	11.7	2.8	3.9	18.4	96.6	3.4	100.0
1921	12.8	60.6	73.4	15.2	4.0	4.0	23.2	96.6	3.4	100.0
1922	7.8	61.8	69.6	18.1	4.1	4.6	26.8	96.4	3.6	100.0
1923	10.0	62.6	72.6	17.9	2.0	4.6	24.5	97.1	2.9	100.0
1924	10.5	59.3	69.8	19.4	2.1	5.7	27.2	97.0	3.0	100.0
1925	7.2	62.1	69.3	20.2	1.7	5.8	27.7	97.0	3.0	100.0
1926	8.9	62.3	71.2	18.5	1.5	5.8	25.8	97.0	3.0	100.0
1927	8.7	57.7	66.4	22.3	1.4	6.6	30.3	96.7	3.3	100.0
1928	8.2	56.4	64.6	22.5	2.0	7.2	31.7	96.3	3.7	100.0
1929	7.5	55.9	63.4	23.3	1.8	8.2	33.3	96.7	3.3	100.0
1930	7.9	54.6	62.5	23.2	1.6	9.3	34.1	96.6	3.4	100.0
1931	7.9	52.1	60.0	25.7	1.4	9.4	36.5	96.5	3.5	100.0
1932	7.6	49.0	56.6	27.5	1.5	10.1	39.1	95.7	4.3	100.0
1933	7.1	49.0	56.1	29.5	1.0	9.4	39.9	96.0	4.0	100.0
1934	7.7	49.7	57.4	27.8	1.1	10.0	38.9	96.3	3.7	100.0
1935	6.7	49.0	55.7	29.0	.9	10.4	40.3	96.0	4.0	100.0
1936	6.1	50.9	57.0	28.2	.9	10.3	39.4	96.4	3.6	100.0
1937	5.5	48.6	54.1	30.9	.6	10.8	42.3	96.4	3.6	100.0
1938	5.6	43.8	49.4	33.8	.7	11.9	46.4	95.8	4.2	100.0
1939	5.8	45.6	51.4	32.3	.9	11.7	44.9	96.3	3.7	100.0
1940	5.2	47.9	53.1	31.1	1.0	11.3	43.4	96.5	3.5	100.0
1941	5.2	49.4	54.6	29.8	1.1	11.1	42.0	96.6	3.4	100.0
1942	5.2	52.1	57.3	27.4	.2	11.2	38.8	96.1	3.9	100.0
1943	5.0	50.2	55.2	28.4	.3	11.9	40.6	95.8	4.2	100.0
1944	4.9	48.9	53.8	29.3	.8	12.0	42.1	95.9	4.1	100.0
1945	4.3	46.5	50.8	30.5	1.3	13.0	44.8	95.6	4.4	100.0
1946	4.8	44.0	48.8	31.6	1.6	13.6	46.8	95.6	4.4	100.0
1947	4.1	46.3	50.4	30.2	1.6	13.8	45.6	96.0	4.0	100.0
1948	4.0	42.9	46.9	32.0	2.0	15.1	49.1	96.0	4.0	100.0
1949 [2]	3.5	36.4	39.9	33.9	2.8	18.5	55.2	95.1	4.9	100.0
1950 [2]	3.2	38.2	41.4	32.6	2.8	18.7	54.1	95.5	4.5	100.0

[1] Percentages based upon figures in table 38.
[2] Preliminary figures.

STOCKS

Stocks of bituminous coal and lignite in the hands of industrial consumers and at retail yards in 1941–50 are shown graphically in figure 1. Stocks at upper Lake docks in 1949–50 are listed in table 1.

TABLE 41.—Stocks of bituminous coal and lignite in hands of commercial consumers and in retail dealers' yards in the United States, 1949–50

Date	Total stocks (net tons)	Days' supply at current rate of consumption on date of stock taking							
		Coke ovens	Steel plants	Other industrial	Electric utilities	Retail yards	Railroads	Cement mills	Total
1949									
Jan. 1	69,373,000	43	38	53	90	9	38	52	46
Feb. 1	67,795,000	45	36	49	91	7	39	50	44
Mar. 1	68,834,000	49	39	49	94	6	42	48	46
Apr. 1	60,511,000	42	37	45	93	5	42	46	42
May 1	65,164,000	47	49	55	111	10	46	51	52
June 1	72,755,000	59	68	70	128	15	51	66	65
July 1	74,161,000	63	74	84	121	15	56	76	68
Aug. 1	69,119,000	61	75	77	126	21	54	72	72
Sept. 1	68,621,000	57	65	66	117	16	49	70	63
Oct. 1	62,064,000	50	59	56	114	7	43	68	51
Nov. 1	47,165,000	42	52	42	97	7	28	48	44
Dec. 1	45,804,000	42	52	34	87	5	24	44	37
Dec. 31	45,111,000	39	39	35	77	4	21	45	32
1950									
Jan. 1	45,111,000	39	39	35	77	4	21	45	32
Feb. 1	37,119,000	29	33	32	64	3	18	41	27
Mar. 1	24,583,000	17	20	23	48	1	14	26	20
Apr. 1	28,054,000	21	21	25	50	4	15	30	22
May 1	37,590,000	28	31	39	63	7	16	32	31
June 1	44,795,000	35	42	47	78	14	20	37	41
July 1	51,376,000	42	51	54	86	15	24	43	46
Aug. 1	51,979,000	39	51	63	94	13	21	47	48
Sept. 1	58,964,000	47	49	63	91	10	23	50	48
Oct. 1	64,293,000	52	53	68	100	11	22	54	52
Nov. 1	70,478,000	57	50	69	101	14	24	56	56
Dec. 1	72,131,000	61	45	61	98	12	25	55	54
Dec. 31	72,516,000	61	39	58	93	8	28	53	50

PRICES

TABLE 42.—Average value per ton, f. o. b. mines, bituminous coal and lignite produced in the United States, by States, 1949–50 [1]

State	1949			1950 (preliminary)
	Strip mines	Underground mines	Total all mines	
Alabama	$5.71	$6.19	$6.12	$6.17
Alaska	6.86	7.86	7.63	7.58
Arizona	----------	4.85	4.85	(2)
Arkansas	5.53	8.54	7.84	7.64
California (lignite)	10.00	----------	10.00	(2)
Colorado	4.84	5.14	5.12	5.12
Georgia	----------	(2)	(2)	(2)
Idaho	----------	7.78	7.78	----------
Illinois	3.90	4.10	4.04	4.13
Indiana	3.93	4.21	4.05	3.88
Iowa	3.61	4.52	4.01	3.79
Kansas	3.86	4.89	3.92	3.92
Kentucky	3.75	5.30	5.04	5.16
Maryland	4.35	5.39	5.24	5.00
Michigan	----------	10.12	10.12	(2)
Missouri	3.97	5.25	4.09	4.08
Montana (bituminous and lignite)	1.30	4.17	2.28	2.14
New Mexico	----------	5.21	5.21	5.37
North Carolina	----------	(2)	(2)	(2)
North and South Dakota (lignite)	2.41	2.17	2.37	2.13
Ohio	3.68	4.40	3.97	3.81
Oklahoma	4.55	6.09	5.04	5.01
Pennsylvania	4.07	5.32	5.01	5.00
Tennessee	4.59	5.33	5.25	5.39
Texas (lignite)	1.02	----------	1.02	(2)
Utah	----------	4.77	4.77	4.76
Virginia	5.13	5.69	5.65	5.58
Washington	6.14	6.79	6.71	6.78
West Virginia	4.54	5.39	5.30	5.16
Wyoming	2.77	4.06	3.83	3.83
Total	3.94	5.18	4.88	4.85

[1] Average gross realization, selling cost not deducted.
[2] Included in total.

The average values per ton of bituminous coal and lignite sold in 1890–1949 are listed in table 3, and those sold in 1905–50 are plotted in figure 2. The average values, classified according to method of mining, in 1914–49 are shown in table 14. The unit prices of railroad fuel and coking coal and the average retail price in 1949–50 are quoted in table 1. Figure 1 includes a graph of prices of railroad fuel in 1941–50. Lignite values are shown separately in tables 43, 44, and 47.

LIGNITE [13]

According to reports received by the Bureau of Mines, United States Department of the Interior, the production of lignite in the United States in 1949, exclusive of small mines producing less than 1,000 tons, totaled 3,092,130 net tons,—a slight increase over 1948 and the highest output since 1937. The average value per ton increased from $2.27 per ton in 1948 to $2.37 in 1949. The average

[13] Compiled by J. A. Corgan and M. I. Cooke.

number of men employed totaled 716, a slight increase over the 694 men working in 1948; and the output per man per day based upon calculated man-days was 18.50 tons in 1949. The industry worked an average of 233 days in 1949 compared with 254 in the preceding year. North Dakota produced 96 percent of the total lignite mined in the United States; California, Montana, South Dakota, and Texas together supplied the remaining 4 percent.

According to the Federal Power Commission, 1,212,901 tons of lignite were consumed in generating electric energy in 1949; this comprises 39 percent of the total lignite mined in the United States in that year. The consumption in the West North Central States was 1,190,935 tons, and the West South Central States and the Mountain States consumed 21,966 tons.

TABLE 43.—Summary of production, value, employment, days operated, man-days of labor, and output per man per day at lignite mines in the United States in 1949, by States [1]

	California	Montana [2]	North Dakota	South Dakota	Texas	Total
Production (net tons):						
Loaded at mines for shipment	----------	----------	2,366,045	620	49,213	2,415,878
Commercial sales by truck or wagon	3,900	45,050	508,714	25,809	----------	583,473
Used by employees, taken by locomotives at tipple, and other uses	----------	10	[3] 82,135	----------	260	82,405
Used at mine for power and heat	----------	8	10,366	----------	----------	10,374
Total:						
1949	3,900	45,068	2,967,260	26,429	49,473	3,092,130
1948	1,450	37,660	2,960,989	29,094	56,693	3,085,886
Value of production:						
Total:						
1949	$39,000	$150,785	$7,003,712	$91,646	$50,410	$7,335,553
1948	$14,500	$124,322	$6,729,426	$86,208	$58,034	$7,012,490
Average per ton:						
1949	$10.00	$3.35	$2.36	$3.47	$1.02	$2.37
1948	$10.00	$3.30	$2.27	$2.96	$1.02	$2.27
Average number of men working daily:						
Underground	----------	29	133	----------	----------	162
Surface (including strip pits)	3	14	504	17	16	554
Total employees:						
1949	3	43	637	17	16	716
1948	4	36	620	18	16	694
Average number of days worked:						
1949	156	167	238	250	223	233
1948	82	175	260	212	265	254
Man-days of labor: 1949	468	7,192	151,639	4,245	3,560	167,104
Average tons per man per day: 1949	8.33	6.27	19.57	6.23	13.90	18.50

[1] Exclusive of small mines producing less than 1,000 tons.
[2] Including output from Custer, Dawson, Richland, Roosevelt, and Sheridan Counties.
[3] Includes some lignite made into briquets.

TABLE 44.—Production, value, employment, days operated, man-days of labor, and output per man per day at lignite mines in the United States in 1949, by States and counties

County	Total production (net tons)	Value of production		Average number of men working daily	Man-days of labor	Average number of days worked	Average tons per man per day
		Total	Average per ton				
CALIFORNIA							
Total California (Amador County) 1949	3,900	$39,000	$10.00	3	468	156	8.33
MONTANA							
Custer	13,793	$47,124	$3.42	11	1,908	173	7.23
Dawson	2,648	7,944	3.00	4	624	156	4.24
Richland	8,756	31,664	3.62	6	1,184	197	7.40
Roosevelt	4,440	17,760	4.00	6	1,050	175	4.23
Sheridan	15,431	46,293	3.00	16	2,426	152	6.36
Total Montana 1949	45,068	150,785	3.35	43	7,192	167	6.27
NORTH DAKOTA							
Adams, Burleigh and Divide	280,710	$721,155	$2.57	59	16,233	275	[1] 17.29
Bowman	5,881	19,336	3.29	6	1,200	200	4.90
Burke	429,152	1,043,909	2.43	65	15,153	233	[1] 28.32
Dunn	7,168	20,070	2.80	4	900	225	7.96
Golden Valley	3,794	10,815	2.86	4	588	147	6.45
Grant	22,658	70,682	3.12	14	2,125	152	[1] 10.66
Hettinger	14,488	42,520	2.93	13	1,840	142	7.87
McKenzie	3,577	12,521	3.50	5	610	122	5.86
McLean	323,134	780,901	2.42	63	14,151	225	[1] 22.83
Mercer	1,225,236	2,766,204	2.26	219	57,959	265	[1] 21.14
Morton	48,888	119,426	2.44	25	4,635	185	[1] 10.55
Oliver	5,476	13,665	2.50	3	504	168	[1] 10.87
Stark	106,658	176,278	1.65	41	8,958	218	[1] 11.91
Ward	472,780	1,154,577	2.44	100	24,596	246	[1] 19.22
Williams	17,660	51,653	2.92	16	2,187	137	8.07
Total North Dakota 1949	2,967,260	7,003,712	2.36	637	151,639	238	19.57
SOUTH DAKOTA							
Corson	2,280	$7,906	$3.47	3	405	135	5.63
Dewey	24,149	83,740	3.47	14	3,840	274	6.29
Total South Dakota 1949	26,429	91,646	3.47	17	4,245	250	6.23
TEXAS							
Total Texas (Milam County) 1949	49,473	$50,410	$1.02	16	3,560	223	[1] 13.90
UNITED STATES							
Total United States 1949	3,092,130	$7,335,553	$2.37	716	167,104	233	18.50

[1] Output is obtained chiefly from strip pits in which the production per man per day is large.

In 1949, the Bureau of Mines received reports from 55 lignite mines producing 1,000 tons or more annually. Seven mines produced over 100,000 tons, and the output of these mines comprised 80 percent of the total production; 3 reported production of 50,000 to 100,000 tons each and supplied 7 percent of the total; and 45 mines producing less than 50,000 tons supplied 13 percent of the total.

TABLE 45.—Number and production of lignite mines in the United States, in 1949, classified by size of output

Class	Mines		Production		
			Net tons		
	Number	Percent	Total	Average per mine	Percent of total
100,000 tons and over	7	13	2,477,735	353,962	80
50,000 and under 100,000	3	5	214,316	71,439	7
10,000 and under 50,000	12	22	257,136	21,428	8
Under 10,000 tons	33	60	142,943	4,332	5
Total 1949	55	100	3,092,130	56,221	100

TABLE 46.—Lignite operations of underground mines in the United States, in 1949, by States

Method	Montana	North Dakota	Total
Shot off the solid ... net tons	40,371	24,885	65,256
Cut by machines [1] ... do		445,462	445,462
Total ... do	40,371	470,347	510,718
Number of employees:			
Underground	29	133	162
All other	7	49	56
Total	36	182	218
Average number of days mines operated	188	254	243
Man-days of labor	6,758	46,187	52,945
Average tons per man per day	5.97	10.18	9.65

[1] A total of 8 machines was used—2 "permissible" and 6 "other types."

The production of lignite from strip pits amounted to 2,581,412 tons—83 percent of the total output of the industry. North Dakota produced 97 percent of the lignite mined by this method; the output of lignite from stripping operations for the other four States totaled only 84,499 tons.

TABLE 47.—Summary of stripping operations that produced lignite in the United States in 1949, by States

	California	Montana	North Dakota	South Dakota	Texas	Total
Number of strip pits [1]	1	1	34	2	1	39
Number of shovels and dragline excavators	1	1	47	2	1	52
Coal produced by stripping ... net tons	3,900	4,697	2,496,913	26,429	49,473	2,581,412
Total value at mines	$39,000	$14,091	$5,982,382	$91,646	$50,410	$6,177,529
Average value per ton	$10.00	$3.00	$2.40	$3.47	$1.02	$2.39
Average number of men working daily:						
In strip pits	3	6	260	15	10	294
All others		1	195	2	6	204
Total	3	7	455	17	16	498
Average number of days worked	156	62	232	250	223	229
Man-days of labor	468	434	105,452	4,245	3,560	114,159
Average tons per man per day	8.33	10.82	23.68	6.23	13.90	22.61

[1] Includes some pits in which stripping is done by hand.

FOREIGN TRADE [14]

TABLE 48.—Bituminous coal [1] imported for consumption in the United States, 1948–50, by countries and customs districts, in net tons

[U. S. Department of Commerce]

Country	1948	1949	1950
North America:			
Canada	289,839	311,801	344,838
Mexico	1,148	165	165
South America: Brazil	--------	--------	53
Europe:			
France	--------	--------	1,650
Greece	--------	13	--------
Italy	--------	6	--------
United Kingdom	350	2,995	--------
Total	291,337	314,980	346,706

Customs district	1948	1949	1950
Alaska	5,755	7,535	4,634
Chicago	--------	6	1,687
Dakota	868	1,438	1,655
Duluth and Superior	42	186	39
Galveston	1,193	--------	--------
Hawaii	--------	8,831	--------
Laredo	--------	165	165
Los Angeles	--------	--------	53
Maine and New Hampshire	112,269	137,033	140,482
Massachusetts	193	--------	--------
Michigan	148	538	3,354
Mobile	--------	2,995	--------
Montana and Idaho	153,777	143,926	164,973
New Orleans	200	--------	--------
New York	--------	144	--------
Philadelphia	--------	--------	3,145
Rochester	55	--------	--------
St. Lawrence	(2)	--------	--------
Vermont	1,403	115	4,255
Washington	15,434	12,068	15,264
Wisconsin	--------	--------	7,000
Total	291,337	314,980	346,706

[1] Includes slack, culm, and lignite.
[2] Less than 1 ton.

TABLE 49.—Exports of bituminous coal, by country groups, 1946–50, in thousands of net tons

[U. S. Department of Commerce]

Year	Canada (including Newfoundland) and Mexico	West Indies and Central America [1]	"Overseas" (all other countries)							Grand total
			Miquelon, Bermuda, and Greenland	South America	Europe	Asia	Africa	Oceania	Total "Overseas"	
1946	[2] 22,035	253	[2] 7	1,723	[2] 16,067	201	[2] 874	37	[2] 18,909	[2] 41,197
1947	[2] 26,171	369	[2] 24	2,866	[2] [3] 36,761	311	2,057	108	[2] 42,127	[3] 68,667
1948	[2] 26,000	214	[2] 4	1,867	16,093	765	961	26	[2] 19,716	45,930
1949	[2] 16,100	140	[2] 6	819	8,682	1,395	612	88	[2] 11,602	27,842
1950	23,010	108	1	1,303	794	147	105	--------	2,350	25,468

[1] Includes Bahamas and Panama.
[2] Revised figure.
[3] Excludes 102,179 tons ($1,010,820) exported to Austria as a part of the Army Civilian Supply Program.

[14] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 50.—Bituminous coal exported from the United States, 1946–50, by countries, in net tons [1]

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
North America:					
Bermuda	2,555	14,567	3,508	731	-
Canada	21,879,705	25,848,117	25,842,797	15,982,038	23,009,089
Newfoundland and Labrador	153,212	321,553	154,932	115,797	
Central America:					
British Honduras	76	30	4	45	50
Canal Zone	9,554	34,342	22,207	9,051	10,632
Costa Rica	62	50	3,177	42	41
El Salvador	77	128	86	176	110
Guatemala	253	257	230	140	337
Honduras	262	302	293	276	372
Nicaragua	10	8	-	-	6
Panama	50	35	45	20	50
Greenland	4,110	4,493	-	-	-
Mexico	1,688	694	1,593	1,617	767
Miquelon and St. Pierre	-	4,864	500	4,697	508
West Indies:					
British:					
Barbados	1,269	2,574	1,225	-	-
Jamaica	65,604	89,339	48,890	32,465	3,360
Leeward and Windward	-	14,800	-	-	-
Trinidad and Tobago	68,038	100,797	57,675	33,502	11,184
Other British	24	491	5	-	20
Cuba	99,798	98,277	76,471	55,907	73,021
Dominican Republic	3,175	7,309	625	106	99
French	5,504	20,448	1,910	9,330	8,940
Haiti	-	2	15	15	15
Netherlands West Indies	63	374	2,004	137	80
Total North America	22,295,089	[2]26,563,851	26,218,192	16,246,092	23,118,681
South America:					
Argentina	486,809	1,113,734	826,750	30,625	97,343
Bolivia	28,211	329	511	15,288	11,101
Brazil	1,083,379	1,468,312	959,323	681,838	1,055,305
Chile	17,372	163,693	27,634	29,472	97,101
Surinam	577	2,570	3,875	2,510	3,008
Uruguay	105,458	117,135	48,705	58,628	39,168
Other South America	787	500	276	321	47
Total South America	1,722,593	2,866,273	1,867,074	818,682	1,303,073
Europe:					
Austria	-	[3]122,391	58,447	-	-
Belgium-Luxembourg	887,957	3,363,800	630,604	-	50,352
Denmark	[2]1,050,065	2,377,583	52,098	-	-
Finland	250,171	637,271	6,273	-	48,107
France	[2]5,065,365	12,466,388	8,459,268	3,639,516	10,944
Germany	-	42,630	70,777	-	31,333
Gibraltar	9,330	156,872	-	-	21,743
Greece	91,676	34,056	62,830	-	-
Iceland	-	57,627	-	-	-
Ireland	-	1,005,584	8	-	10,827
Italy	[2]4,697,237	8,780,259	4,696,415	3,912,139	114,578
Netherlands	[2]1,618,244	2,691,248	770,761	310,961	33,629
Norway	[2]753,808	738,735	-	-	5,643
Portugal	455,024	846,901	257,230	184,275	26,378
Sweden	860,854	2,074,092	587,322	437,012	140,882
Switzerland	307,586	683,400	420,621	186,655	195,975
United Kingdom	-	675,043	-	-	103,579
Other Europe	[2]19,918	6,966	20,117	11,226	-
Total Europe	[2]16,067,235	[2]36,760,846	16,092,771	8,681,784	793,970
Asia:					
China	88,321	4,234	40,078	40,002	-
Hong Kong	39,696	92,203	-	-	-
India	-	10	32,376	-	-
Indochina	14,494	2,520	-	-	-
Indonesia	-	95,417	-	-	-
Israel-Jordan	-	3,436	-	-	-
Japan	-	-	688,776	1,355,102	147,218
Malaya	58,940	99,519	-	-	-
Syria	-	13,667	-	-	-
Other Asia	11	23	3,934	10	25
Total Asia	201,462	311,029	765,164	1,395,114	147,243

See footnotes at end of table.

TABLE 50.—Bituminous coal exported from the United States, 1946–50, by countries, in net tons [1]—Continued

Country	1946	1947	1948	1949	1950
Africa:					
Algeria	[2] 547,118	1,052,370	556,686	265,576	68,211
Belgian Congo		14,151			
British West Africa		36,425			
Canary Islands		51,822	2,082		6,193
Cape Verde Islands	25,685	89,354	(4)	(4)	(4)
Egypt	85,399	298,135	27,596		3,557
French Cameroon		140	17,206	22,740	
French Equatorial Africa			10,827	46,517	
French Morocco	47,031	92,020	169,551	127,753	
French West Africa	40,505	244,643	132,668	84,595	
Libya		27,083			
Madagascar			10,918	55,273	
Madeira Islands	27,838	21,491			
Spanish Africa, n. e. s.		114,311	22,481		
Tunisia	99,931	14,531		9,291	27,470
Other Africa	5	935	10,725	6	5
Total Africa	[2] 873,512	2,057,411	960,740	611,751	105,436
Oceania	37,487	107,553	26,192	88,633	
Grand total	[2] 41,197,378	[3] 68,666,963	45,930,133	27,842,056	25,468,403

[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in foreign trade, which aggregated 1,380,514 tons in 1946, 1,689,328 tons in 1947, 1,057,118 tons in 1948, 874,029 tons in 1949, and 717,488 tons in 1950.
[2] Revised figure.
[3] Exclusive of 103,179 tons exported to Austria as a part of the Army Civilian Supply Program.
[4] Beginning Jan. 1, 1948, not separately classified.

TABLE 51.—Bituminous coal exported from the United States, 1946–50, by customs districts, in net tons

[U. S. Department of Commerce]

Customs district	1946	1947	1948	1949	1950
North Atlantic:					
Maine and New Hampshire	[1] 16,371	57,408	5,586	6,276	4,208
Massachusetts	1,691	61		68	30
New York	[1] 692,940	1,382,037	23,788	7,196	1,294
Philadelphia	2,480,405	2,740,855	453,540	32,150	22,217
Rhode Island	73				
South Atlantic:					
Georgia		10,708		560	49
Maryland	[1] 6,462,745	10,871,709	3,471,674	1,336,249	337,153
South Carolina	[1] 1,379,608	1,825,197	768,520	54,450	
Virginia	4,437,316	20,146,083	13,827,771	10,061,387	2,104,393
Gulf coast:					
Florida	[1] 1,367,904	2,015,102	330,455	3,501	4,618
Galveston	633,911	463,494			
Mobile	809,566	1,427,881	617,042	26,388	66,874
New Orleans	20,129	315,944	7,968	1,569	1,545
Sabine	531,302	731,418			
Mexican border:					
Arizona	264	272	273	265	399
El Paso	58	45	1,138	1,317	211
Laredo	27	27			
Pacific coast:					
Los Angeles	334,727	142,522	100		
Oregon	138,019	379,239	10,982		325
San Diego	92	83	125	10	157
San Francisco	15	20	60	115	62
Washington	92,037	301,035	134,461	37,929	6,112

See footnotes at end of table.

TABLE 51.—Bituminous coal exported from the United States, 1946–50, by customs districts, in net tons—Continued

Customs district	1946	1947	1948	1949	1950
Northern border:					
Buffalo	[1] 1,586,052	1,548,629	1,103,124	744,288	979,624
Chicago	[1] 1,199,559	1,505,335	1,633,134	711,818	442,569
Dakota	30,360	23,392	36,373	50,210	36,728
Duluth and Superior	300,414	385,036	340,995	204,062	207,212
Michigan	2,369,744	3,046,644	3,127,640	2,245,509	3,662,662
Montana and Idaho	48	4,431	723	1,284	614
Ohio	[1] 10,445,808	11,619,905	13,314,027	8,763,909	12,456,669
Rochester	[1] 2,905,756	3,829,918	3,465,712	1,798,570	3,068,678
St. Lawrence	[1] 2,871,811	3,677,266	2,815,519	1,473,762	2,062,946
Vermont	2,517	4,106	5,041	1,575	1,044
Wisconsin	538	193			
Miscellaneous:					
Alaska	413	204	283	10	
Colorado		3,037			
Hawaii	70,346	3,282			
Indiana		5			
Minnesota	5,984			74	
Pittsburgh		11,210			
Puerto Rico	4	325			10
Total	[1 2] 41,197,378	[3] 68,666,963	[3] 45,930,133	[3] 27,842,056	25,468,403

[1] Revised figure.
[2] Includes 8,824 tons, representing export shipments (except by air) individually valued under $25, data for which are not separately classified by customs districts.
[3] Includes 192,905 tons in 1947, 434,070 tons in 1948, and 277,555 tons in 1949, representing shipments on vessels operated by the United States Army or Navy. Excludes 102,179 tons exported to Austria in 1947 as a part of the Army Civilian Supply Program.

TABLE 52.—Shipments of bituminous coal to noncontiguous Territories, 1948–50

[U. S. Department of Commerce]

Territory	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
Puerto Rico	1,500	$15,607	4,999	$48,366	6,007	$58,142
Virgin Islands	25,799	264,564	20,601	196,211	19,473	174,883

WORLD PRODUCTION

World production of anthracite and bituminous coal amounted to 1,508 million metric tons in 1950 and of lignite to 286 million tons—a total of 1,794 million tons. Total coal output in 1950, including lignite, was 141 million metric tons over that of 1949. Of the total world coal output, 73 percent was produced in four countries—the United States, Russia, Germany, and the United Kingdom. The United States supplied 505 million metric tons (bituminous, anthracite, and lignite) or 28 percent of the world output in 1950.

Most coal-producing countries in Europe enjoyed increased production during 1950; however, consumption requirements of the principal coal-producing countries on the European Continent exceeded available supplies.

Although increased world production was anticipated in 1951, it was expected that European output would not be adequate to meet requirements, and that the United States would be depended upon to make up a large part of the deficit.

TABLE 53.—World production of bituminous coal, anthracite, and lignite, by countries, 1943–50, in thousands of metric tons [1]

[Compiled by Berenice B. Mitchell and Pauline Roberts]

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
North America:								
Canada:								
Bituminous	14,689	14,201	13,584	14,776	12,971	15,296	15,648	15,361
Lignite	1,512	1,245	1,391	1,382	1,425	1,442	1,697	1,998
Greenland: Bituminous	7	8	7	8	6	7	9	(2)
Mexico: Bituminous	1,025	904	915	977	1,055	1,057	1,075	[3] 1,000
United States:								
Anthracite (Pennsylvania)	55,015	57,789	49,835	54,891	51,882	51,836	38,738	40,272
Bituminous	532,903	559,750	521,582	481,943	569,482	541,072	394,420	461,501
Lignite	2,494	2,317	2,421	2,420	2,607	2,799	2,805	2,975
South America:								
Argentina: Bituminous [4]	8	5	3	3	14	17	18	[3] 18
Brazil:								
Bituminous	1,537	1,415	1,492	1,274	1,999 (Bituminous and lignite)	2,025	2,117	[3] 1,940
Lignite	23	16	9	(2)				
Chile: Bituminous	2,032	2,047	1,851	1,743	1,850	2,015	1,882	[3] 1,960
Colombia: Bituminous [5]	640	667	712	738	[3] 800	[3] 900	[3] 1,015	(2)
Peru: Bituminous and anthracite	187	173	201	230	215	189	170	(2)
Venezuela: Bituminous	11	9	7	4	[3] 15	21	[3] 24	(2)
Europe:								
Albania: Lignite [3]	10	5	5	12	20	16	(2)	(2)
Austria:								
Bituminous	214	195	72	108	178	181	183	[3] 180
Lignite	3,646	3,674	2,066	2,407	2,839	3,338	3,816	4,309
Belgium: Bituminous and anthracite	23,737	13,529	15,833	22,852	24,436	26,679	27,850	27,303
Bulgaria:								
Bituminous	204	125	128	93	120	300	(2)	(2)
Lignite	3,812	2,890	3,435	3,420	4,011	[6] 3,571	(2)	(2)
Czechoslovakia:								
Bituminous	24,500	23,159	11,716	14,167	16,216	17,746	17,003	18,456
Lignite	26,750	26,112	15,356	19,475	22,362	23,589	26,526	27,506
Denmark: Lignite	2,600	2,290	2,320	2,300	2,800	2,347	1,600	[3] 700
France:								
Bituminous and anthracite	40,531	25,241	33,313	47,185	45,216	43,291	51,199	50,818
Lignite	1,896	1,336	1,704	2,104	2,093	1,838	1,845	1,688
Saar	16,157	12,380	3,463	7,887	10,541	12,567	14,262	15,092
Germany: [7]								
Bituminous:								
Federal Republic	142,460 (Federal Republic and Soviet Zone)	122,956 (Federal Republic and Soviet Zone)	36,696	55,260	72,528	88,416	104,808	110,756
Soviet Zone			(2)	2,520	2,754	2,840	[8] 3,000	[8] 3,000
Lignite:								
Federal Republic	254,605 (Federal Republic and Soviet Zone)	230,808 (Federal Republic and Soviet Zone)	24,252	51,588	58,728	64,860	72,064	75,840
Soviet Zone			[3] 83,000	[3] 109,000	[3] 102,000	[3] 110,000	[3] 117,000	[3] 123,000
Greece: Lignite	370	190	70	125	133	125	180	[3] 160
Hungary:								
Bituminous	1,376	[9] [10] 1,050	[9] 711	722	1,059	1,238	[3] 1,380	(2)
Lignite	11,296	[9] [10] 8,400	[9] 3,574	5,630	7,750	9,377	[3] 10,450	(2)
Ireland: Bituminous and anthracite	186	206	216	216	221	182	115	181
Italy:								
Bituminous and anthracite	1,358	613	758	1,178	1,358	972	1,104	1,030
Lignite	1,934	496	767	1,521	1,851	907	832	780
Netherlands:								
Bituminous	12,497	8,313	5,097	8,314	10,104	11,032	11,705	12,247
Lignite	383	243	130	499	474	279	205	194
Poland:								
Bituminous	[11] 91,362	[11] 87,389	27,366	47,288	59,130	70,262	74,103	[3] 77,530
Lignite	(2)	(2)	(2)	1,455	4,766	5,040	4,627	[3] 4,750
Portugal:								
Bituminous and anthracite	403	426	436	380	370	387	443	426
Lignite	106	127	163	141	108	103	111	95
Rumania:								
Bituminous and anthracite	306	202	211	167	163	2,631 (Bituminous, anthracite, and lignite)	187	[3] 3,045 (Bituminous, anthracite, and lignite)
Lignite	2,604	2,069	1,820	1,784	2,105		2,576	

See footnotes at end of table.

TABLE 53.—World production of bituminous coal, anthracite, and lignite, by countries, 1943–50, in thousands of metric tons [1]—Continued

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
Europe—continued								
Spain:								
Bituminous and anthracite	9,591	10,485	10,732	10,759	10,606	10,627	10,641	10,183
Lignite	1,112	1,202	1,351	1,336	1,263	1,400	1,321	[3] 1,350
Svalbard (Spitsbergen): Bituminous	---	---	6	96	336	516	[12] 455	[12] 379
Sweden: Bituminous	557	570	615	488	416	374	317	303
Switzerland:								
Bituminous and anthracite	157	71	180	94	15	---	---	---
Lignite	75	74	130	81	12	---	---	---
U. S. S. R.:								
Bituminous and anthracite [3]	131,400 (Bituminous and anthracite and Lignite)	118,000	146,000	161,000 (Bituminous and anthracite and Lignite)	175,000	209,000	236,000	264,000
Lignite [3]		(2)	(2)					
United Kingdom:								
Great Britain: Bituminous and anthracite [13]	202,113	195,840	185,707	193,117	200,617	212,755	218,570	219,791
Northern Ireland:								
Bituminous	(14)	(14)	(14)	(14)	1	1	(14)	(2)
Lignite	1	2	3	(14)	(14)	(14)	(14)	(2)
Yugoslavia:								
Bituminous	1,390 (Bituminous and Lignite)	(2)	206	757	1,062	972	1,289	[3] 13,000 (Bituminous and Lignite)
Lignite			3,405	6,047	8,229	9,751	10,833	
Asia:								
Afghanistan: Bituminous	---	---	12	5	5	[3] 15	5	(2)
China: Bituminous and anthracite	[3] 62,713	[3] 62,465	16,576	11,475	14,148	[3] 8,720	[3] 16,000	[3] 36,660
Taiwan (Formosa): Bituminous	2,324	1,653	795	1,058	1,307	1,629	1,649	1,402
India: Bituminous	25,921	26,546	29,635	30,186	30,628	30,608	31,962	32,506
Indochina:								
Bituminous and anthracite	996	533	231	262	248	359	385	497
Lignite	25	4	---	---	---	---	---	---
Indonesia: Bituminous	1,038	753	307	157	299	[15] 537	662	[3] 790
Iran: Bituminous [16]	69	100	[3] 150	[3] 150	188	(2)	170	(2)
Japan:								
Bituminous and anthracite	[17] 55,539	[17] 49,335	[17] 22,371	20,376	27,235	33,864	38,064	38,461
Lignite	[17] 2,876	[17] 2,304	[17] 1,643	2,352	2,820	2,552	2,088	1,263
Korea:								
North Korea:								
Anthracite	2,939	3,132	34	[3] 821	[3] 1,352	(2)	(2)	(2)
Lignite	2,386	2,492	1	[3] 432	[3] 1,616	(2)	(2)	(2)
South Korea:								
Anthracite	1,218	1,398	640	251	463	799	1,066	[18] 397
Lignite	44	27	17	26	37	68	60	[18] 15
Malaya: Bituminous	497	416	230	228	230	381	393	422
Pakistan: Bituminous	(19)	(19)	(19)	(19)	340	250	337	[3] 430
Philippines: Bituminous	(2)	(2)	(2)	48	74	88	123	159
Syria and Lebanon: Lignite	1	2	2	(14)	---	(14)	---	(2)
Turkey:								
Bituminous	2,071	2,383	2,150	2,312	2,623	2,669	2,705	2,824
Lignite	414	533	571	484	628	829	939	[3] 907
U. S. S. R.: Sakhalin, southern: Bituminous [21]	[20] 7,500	[20] 8,000	(20 2)	(20 2)	(20 2)	(20 2)	(20 2)	(20 2)
Africa:								
Algeria:								
Bituminous and anthracite	117	120	162	215	206	226	265	258
Lignite	1	1	(2)	(2)	(2)	(2)	(2)	(2)
Belgian Congo: Bituminous and anthracite	70	49	50	102	102	117	152	(2)
French Morocco Anthracite	102	134	179	222	269	290	341	368
Madagascar: Bituminous	1	2	3	(14)	---	(2)	16	(2)
Mozambique: Bituminous	13	16	12	16	16	9	13	(2)

See footnotes at end of table.

TABLE 53.—World production of bituminous coal, anthracite, and lignite, by countries, 1943–50, in thousands of metric tons [1]—Continued

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
Africa—continued								
Nigeria: Bituminous	514	624	521	617	589	618	559	[3] 570
Southern Rhodesia: Bituminous	1,779	1,808	1,669	1,613	1,508	1,695	1,918	2,128
Tunisia: Lignite	41	66	69	95	76	71	47	41
Union of South Africa: Bituminous	20,561	22,987	23,554	23,601	23,818	24,017	25,496	26,473
Oceania:								
Australia:								
Bituminous	14,421	13,977	12,998	14,104	15,069	15,018	14,324	16,786
Lignite	5,173	5,097	5,532	5,799	6,239	6,800	7,494	7,416
New Zealand:								
Bituminous and anthracite	1,157	1,085	980	974	951	968	952	970
Lignite	1,676	1,766	1,899	1,865	1,845	1,853	1,907	1,822
Total all grades	1,838,000	1,765,000	1,356,000	1,471,000	1,640,000	1,713,000	1,653,000	1,794,000
Lignite (total of items shown above)	328,000	309,000	169,000	224,000	239,000	257,000	277,000	286,000
Bituminous coal and anthracite (by subtraction)	1,510,000	1,456,000	1,187,000	1,247,000	1,401,000	1,456,000	1,376,000	1,508,000

[1] Coal is also mined in British Borneo, Faroe Islands, and Italian East Africa (formerly), but production figures are not available and no estimate is included in the total.
[2] Data not available; estimate included in total.
[3] Estimate.
[4] In addition, the following quantities (metric tons) of asphaltite were produced and used as solid fuels: 1943, 105,625; 1944, 106,300; 1945, 135,300; 1946, 83,800; 1947, 80,900; 1948, 82,289; 1949, 79,477; 1950 data not available.
[5] Data previously published only production transported by rail.
[6] Includes anthracite.
[7] Does not include production of the Saar.
[8] Planned production.
[9] Data represents Trianon Hungary subsequent to 1944.
[10] January to October, inclusive.
[11] Includes that part of Germany which is under Polish administration (east of the Oder and Neisse Rivers).
[12] Norwegian mines only.
[13] Includes open-cast coal as follows, in thousands of tons: 1943, 4,498; 1944, 8,787; 1945, 8,246; 1946, 8,965 1947, 10,410; 1948, 11,937; 1949, 12,639; 1950, 12,380.
[14] Production less than 1,000 tons.
[15] Excludes production of Ombilin mines in Sumatra.
[16] Fiscal year ended Mar. 20 of year following that stated.
[17] Fiscal year ended Mar. 31 of year following that stated.
[18] January to April, inclusive.
[19] Included with India.
[20] Output from U. S. S. R. in Asia included with U. S. S. R. in Europe.
[21] Formerly Karafuto.

Coal—Pennsylvania Anthracite

By J. A. Corgan and Marian I. Cooke

GENERAL SUMMARY

PRODUCTION of Pennsylvania anthracite in 1950 totaled 44,076,703 net tons,[1] an increase of 3 percent over the output in 1949. As anthracite is used primarily for heating homes, apartments, hotels, etc., consumption fluctuates with the severity of the weather. In the New England and Middle Atlantic States and Canada—the primary markets for anthracite—the weather was considerably colder in 1950 than in 1949; hence, a large part of the increase in production may be attributed to colder weather. Competition from fuel oil and natural gas continued strong, and there was probably some loss to these fuels. Exports to countries other than Canada declined drastically in 1950 from 1949; however, it was expected that the demand for solid fuels would increase sharply in foreign countries during 1951 and that shipments of anthracite abroad would exceed those in 1950 by a substantial margin.

According to data of the Pennsylvania Department of Mines, the Middle Atlantic and New England States received approximately 84 percent of the total anthracite shipments in 1950; 6 percent was shipped to other States, and Canada and other foreign countries received 10 percent.

There was little change from 1949 in the percentages of anthracite produced by the various types of mining. Underground mining operations yielded 64 percent of the 1950 total, open-pit mining 27 percent, and culm-bank recovery 8 percent; the remaining 1 percent was obtained by dredging the rivers and creeks of the anthracite region. The number of men employed declined 4 percent, and the output per man per day remained virtually the same; thus the increased production was achieved by the 8-percent increase in average number of days worked.

Statistical Trends.—Pertinent statistical data on the Pennsylvania anthracite industry are presented in tables 1, 2, and 3.

Anthracite Committee.—The specifications approved and adopted by the Anthracite Committee in 1947 for "standard" anthracite (under the Anthracite Standards Law of the Commonwealth of Pennsylvania) were continued in effect in 1950. The specifications apply to Buckwheat No. 2 and larger sizes and limit the maximum amount of ash content and the quantity of undersized coal permitted in the marketed product. Coal that fully meets the specifications is referred to as "standard" anthracite, and that which does not conform is classed as "substandard" and must be so labeled before shipment. Standard anthracite specifications approved and adopted by the Anthracite Committee are shown in table 4. The committee continued its regular activities relating to production and requirements of anthracite.

[1] All tonnage figures in this chapter are expressed in net tons of 2,000 pounds unless otherwise stated.

TABLE 1.—Salient statistics of the Pennsylvania anthracite industry, 1946–50

	1946	1947	1948	1949	1950
Production:					
Loaded at mines for shipment outside producing region:					
Breakers net tons	50, 115, 427	[1] 48, 073, 153	47, 816, 627	35, 653, 628	37, 658, 864
Washeries do	3, 106, 521	[1] 2, 009, 233	1, 725, 124	1, 380, 115	882, 541
Dredges do	886, 639	970, 027	941, 441	655, 753	488, 739
Sold to local trade and used by employees net tons	4, 435, 536	4, 232, 871	4, 795, 721	3, 848, 420	3, 930, 889
Used at collieries for power and heat net tons	1, 962, 750	1, 904, 725	1, 861, 035	1, 163, 808	1, 115, 670
Total production do	60, 506, 873	57, 190, 009	57, 139, 948	42, 701, 724	44, 076, 703
Value at breaker, washery, or dredge	$413, 417, 070	$413, 019, 486	$467, 051, 800	$358, 008, 451	$392, 398, 006
Average sales realization per net ton on breaker shipments:					
Domestic	$9. 21	$9. 82	$11. 05	$11. 39	$11. 94
Steam	$4. 08	$4. 32	$4. 90	$5. 05	$5. 25
Total all sizes	$7. 25	$7. 65	$8. 67	$8. 90	$9. 34
Percent of total breaker shipments:					
Domestic	61. 8	60. 4	61. 3	60. 6	61. 1
Steam	38. 2	39. 6	38. 7	39. 4	38. 9
Producers' stocks at end of year [2] net tons	251, 168	702, 109	963, 839	975, 457	1, 268, 300
Exports [3] do	6, 497, 245	8, 509, 995	6, 675, 914	4, 942, 670	3, 891, 569
Imports [3] do	9, 556	10, 350	945		18, 289
Consumption (apparent) do	53, 900, 000	48, 200, 000	50, 200, 000	37, 700, 000	39, 900, 000
Average number of days worked	271	259	265	195	211
Average number of men employed	78, 145	78, 600	76, 215	75, 377	72, 624
Output per man per day net tons	2. 84	2. 78	2. 81	2. 87	2. 83
Output per man per year do	770	720	745	560	597
Quantity cut by machines do	1, 232, 828	1, 209, 983	1, 016, 757	557, 599	611, 734
Quantity mined by stripping do	12, 858, 930	12, 603, 545	13, 352, 874	10, 376, 808	11, 833, 934
Quantity loaded by machines underground net tons	15, 619, 162	16, 054, 011	15, 742, 368	11, 858, 088	12, 335, 650
Distribution:					
Total receipts in New England [4] net tons	5, 643, 076	4, 737, 946	4, 862, 834	3, 445, 543	3, 677, 738
Exports to Canada [3] do	4, 513, 637	4, 470, 034	4, 931, 918	3, 583, 297	3, 798, 285
Loaded into vessels at Lake Erie [5] net tons	1, 112, 996	936, 040	1, 125, 050	611, 888	611, 411
Receipts at Duluth-Superior [6] do	639, 900	446, 605	538, 992	271, 854	254, 362

[1] Small quantity of washery coal included with "Breakers."
[2] Anthracite Committee.
[3] U. S. Department of Commerce.
[4] Commonwealth of Massachusetts, Division on the Necessaries of Life; and Association of American Railroads
[5] Ore and Coal Exchange, Cleveland, Ohio.
[6] U. S. Engineer, Duluth, Minn.

Anthracite Institute.—During 1950 the anthracite industry appropriated over a million dollars for advertising, promotion, and information purposes. Television was utilized for the first time in 10 large cities throughout the primary market areas to convince the public of the advantages of Pennsylvania anthracite and automatic anthracite-burning equipment. A strong advertising campaign was continued in many American and Canadian newspapers and trade journals, exhibits were included in several home and trade shows, and promotional literature and an advertising mat service were developed for retail dealers. The institute also began monthly publication of a Retail Dealer News Bulletin intended to give this important segment of the industry the latest information on subjects of interest to fuel merchants.

During 1950 14 heating engineers were added to the staff of the institute to provide free consultation service to owners and managers of commercial and public buildings regarding problems of heating equipment and combustion practices. This new activity is designed primarily to promote greater use of anthracite through consultation

TABLE 2.—Statistical summary of monthly developments in the Pennsylvania anthracite industry in 1950

[All tonnage figures are net tons]

	January	February	March	April	May	June	July	August	September	October	November	December	Year 1950	Change from 1949 (percent)	Year 1949
Production (including mine fuel, local sales, and dredge coal)	2,893,000	2,563,000	4,847,000	3,331,000	4,228,000	4,166,000	2,855,000	4,386,000	3,835,000	4,282,000	3,355,000	3,336,000	44,077,000	+3.2	42,702,000
Shipments (breakers and washeries only, all sizes):															
By rail [1]	2,085.030	1,883,031	3,594.895	2,615,786	3,457,647	3,319,253	2,621,269	3,707,751	3,387,522	3,496.649	2,673,872	2,740,423	35,583,128	+1.0	35,232,356
By truck [2]	607,265	624,231	900,883	494,835	461,819	437,820	341,274	607,973	525,753	575,161	565,991	737,680	6,880,685	+13.0	6,088,124
Carloadings [3]	45,873	39,222	75,599	51,426	66,499	65,718	47,272	72,175	62,670	67,827	52,179	52,171	698,631	+1.5	688,438
Distribution:															
Lake Erie loadings [4]	--------	--------	--------	45,615	101,018	37,057	80,539	86,976	81,648	116,532	62.026	--------	611,411	−.1	611,888
Lake Ontario loadings [5]	--------	--------	--------	6,821	23,609	24.081	17,696	20,515	34,106	31,330	8,653	--------	166,811	−1.0	168,554
Receipts at Duluth-Superior [6]	--------	--------	--------	--------	35,152	14,608	17,293	45,423	46,284	61,282	34,320	--------	254,362	−6.4	271,854
Upper Lake dock trade: [7]															
Receipts from Lower-Lake docks:															
Lake Superior	--------	--------	--------	--------	37,035	22,374	19,562	56,353	53,876	77,093	46,805	1,594	314,692	+14.1	275,744
Lake Michigan	730	1,700	8,816	50,103	69,943	29,306	38,464	20,664	51,848	64,928	28,275	14,231	379,008	+13.4	334,273
Reloadings for final delivery:															
Lake Superior	45,988	38,780	8,776	1,467	4,157	13,094	12,514	28,407	34,979	47,868	32,979	27,896	296,905	−16.8	356,992
Lake Michigan	48,904	48,277	27,958	17,499	25,439	37,628	27,219	34,861	37,836	31,097	26,198	26,941	389,857	+2.0	382,316
New England receipts:															
Tide-water [3]	1,081	2,493	2,830	6,633	20,213	4,346	2.452	4,723	5,997	4,872	4,258	2,802	62,700	−42.9	109,754
Rail [8]	214,769	206,371	353.649	275,102	371,571	295,017	278,735	393,110	305.428	388,313	281,340	251,633	3,615,038	+8.4	3,335,789
Exports [9]	149,398	200,827	364,373	261,125	363,849	344,618	274,971	318,127	479,559	460,996	346,156	327,570	3,891,569	−21.3	4,942,670
Imports [9]	--------	--------	7,964	--------	--------	--------	171	--------	4,494	--------	35	5,625	18,289	--------	--------
Industrial consumption and stocks:															
Railroads (class 1 only): [3]															
Consumption	80,662	88,956	86,800	57,720	49,910	38,310	47,864	49,321	50,580	61,876	74,670	85,219	771,888	+4.9	735,718
Stocks at end of month	65,919	62,570	56,848	53,608	58,245	61,853	55,758	55,080	57,332	60,789	56,301	61,081	61,081	−8.0	66,388
Electric utilities [10]															
Consumption	285,395	271,807	295,204	271,500	285,630	289,794	284.105	336,609	316,880	330,102	308,034	333,803	3,608,863	+7.6	3,353,857
Stocks at end of month	4,244,785	4,155,111	4,153,942	4,191,352	4,281,214	4.369,657	4,439,327	4,542,204	4 634,533	4,707,823	4,747,222	4,720,147	4,720,147	+10.8	4,259,533
Stocks on Upper Lake docks at end of month: [7]															
Lake Superior	66,788	18,517	10,016	8.680	40,289	50,039	57,313	84,073	103,004	131,976	145,381	119,078	119,078	+5.7	112,652
Lake Michigan	85,999	39,258	20,116	52.720	97,224	88,902	100,147	85,950	99.931	133,793	135,870	123,159	123,159	−8.2	134,173
Producers' stocks [11]	657,710	358,212	183,169	289,474	408,401	555,597	636,764	878,374	1,034,817	1,297,915	1,415,956	1,268,300	1,268,300	+30.0	975,457
Sales of mechanical stokers: [9]															
Class 1 (capacity under 61 lb. of coal per hour)	127	97	167	159	180	285	423	603	717	642	455	336	4,191	−9.2	[12] 4,616
Class 2 (capacity 61 to 100 lb. of coal per hour)	24	10	20	14	18	24	31	67	87	49	36	107	487	−.4	[12] 489

Wholesale price indices (1926=100):[13]															
On tracks, destination:															
Chestnut	135.4	135.4	138.6	139.5	135.5	136.8	137.9	139.1	140.0	141.2	142.0	143.2	138.7	+4.1	133.2
Pea	154.9	154.9	156.6	156.8	154.5	154.8	155.5	156.4	156.8	157.8	158.5	159.3	156.4	+2.6	152.4
Employee wages and hours:[13]															
Average weekly earnings	$44.60	$40.23	$80.01	$57.25	$68.81	$64.94	$68.59	$65.77	$68.45	$75.59	$60.85	$65.14	$63.24	+11.4	$56.78
Average hourly earnings	$1.866	$1.953	$1.928	$1.974	$1.983	$1.992	$1.971	$1.981	$1.984	$2.032	$1.963	$1.986	$1.970	+4.8	[12] $1.880
Average number hours worked per week	23.9	20.6	41.5	29.0	34.7	32.6	34.8	33.2	34.5	37.2	31.0	32.8	32.1	+6.3	30.2

[1] Furnished by Anthracite Institute.
[2] Pennsylvania Department of Mines.
[3] Association of American Railroads.
[4] Nearly all for Upper Lake docks. Source: Ore and Coal Exchange, Cleveland, Ohio.
[5] Partly destined for Canada. Source: Buffalo Branch, Ore and Coal Exchange, Cleveland, Ohio.
[6] U. S. Engineer Office, Duluth, Minn.
[7] Includes all commercial docks on Lake Superior and west shore of Lake Michigan as far south as Kenosha. Based on data courteously supplied by Maher Coal Bureau and direct reports to the Bureau of Mines.
[8] Furnished by Commonwealth of Massachusetts, Division on the Necessaries of Life.
[9] U. S. Department of Commerce.
[10] Federal Power Commission.
[11] Anthracite Committee. Represents coal in storage nearest available date to the end of the month.
[12] Revised figure.
[13] Bureau of Labor Statistics.

TABLE 3.—Statistical trends in the Pennsylvania anthracite industry, 1890–1950 [1]

Year	Production (net tons)	Value of production	Average value per net ton	Exports [2] (net tons)	Imports [2] (net tons)	Apparent consumption [3] (net tons)	Average number of employees	Average number of days worked	Average tons per man per day	Average tons per man per year	Quantity cut by machines [4] (net tons)	Quantity produced by stripping [5] (net tons)	Quantity loaded mechanically underground [6] (net tons)
1890	46,468,641	$66,383,772	$1.43	889,655	16,962	45,596,000	126,000	200	1.85	369			
1891	50,665,431	73,944,735	1.46	964,601	42,120	49,743,000	126,350	203	1.98	401			
1892	52,472,504	82,442,000	1.57	953,836	72,865	51,592,000	129,050	198	2.06	407			
1893	53,967,543	85,687,078	1.59	1,493,281	60,220	52,534,000	132,944	197	2.06	406			
1894	51,921,121	78,488,063	1.51	1,613,500	100,876	50,408,000	131,603	190	2.08	395			
1895	57,999,337	82,019,272	1.41	1,647,195	158,297	56,510,000	142,917	196	2.07	406			
1896	54,346,081	81,748,651	1.50	1,512,000	113,892	52,948,000	148,991	174	2.10	365			
1897	52,611,681	79,301,954	1.51	1,454,620	27,478	51,185,000	149,884	150	2.34	351			
1898	53,382,645	75,414,537	1.41	1,513,062	3,527	51,873,000	145,504	152	2.41	367			
1899	60,418,005	88,142,130	1.46	1,912,732	68	58,505,000	139,608	173	2.50	433			
1900	57,367,915	85,757,851	1.49	1,853,163	132	55,515,000	144,206	166	2.40	398			
1901	67,471,667	112,504,020	1.67	2,232,504	320	65,239,000	145,309	196	2.37	464			
1902	41,373,595	76,173,586	1.84	1,016,934	190,636	40,547,000	148,141	116	2.40	279			
1903	74,607,068	152,036,448	2.04	2,249,920	196,837	72,554,000	150,483	206	2.41	496			
1904	73,156,709	138,974,020	1.90	2,495,799	81,232	70,742,000	155,861	200	2.35	469			
1905	77,659,850	141,879,000	1.83	2,497,581	38,350	75,201,000	165,406	215	2.18	470			
1906	71,282,411	131,917,694	1.85	2,483,005	36,236	68,836,000	162,355	195	2.25	439			
1907	85,604,312	163,584,056	1.91	3,021,841	11,085	82,594,000	167,234	220	2.33	512			
1908	83,268,754	158,178,849	1.90	3,082,641	18,462	80,205,000	174,174	200	2.39	478			
1909	81,070,359	149,181,587	1.84	3,183,840	3,574	77,890,000	[7] 171,195	205	[8] 2.31	[8] 474			
1910	84,485,236	160,275,302	1.90	3,384,222	9,180	81,110,000	169,497	229	2.17	498			
1911	90,464,067	175,189,392	1.94	3,980,479	2,759	86,486,000	172,585	246	2.13	524	69,907		
1912	84,361,598	177,622,626	2.11	4,131,444	1,870	80,232,000	174,030	231	2.10	485	246,216		
1913	91,524,922	195,181,127	2.13	4,652,912	1,004	85,474,000	175,745	257	2.02	520	555,776		
1914	90,821,507	188,181,399	2.07	4,289,873	17,696	84,041,000	179,679	245	2.06	505	916,596		
1915	88,995,061	184,653,498	2.07	3,965,255	814	88,144,000	176,552	230	2.19	504	1,307,756	1,121,603	
1916	87,578,493	202,009,561	2.31	4,665,530	6,000	87,118,000	159,869	253	2.16	548	1,839,506	1,987,800	
1917	99,611,811	283,650,723	2.85	6,007,306	13,000	94,068,000	154,174	285	2.27	646	1,955,223	2,301,588	
1918	98,826,084	336,480,347	3.40	4,967,808	37,272	92,775,000	147,121	293	2.29	672	1,857,514	2,360,183	
1919	88,092,201	364,926,950	4.14	4,976,598	82,818	81,518,000	154,571	266	2.14	570	1,575,205	2,006,879	
1920	89,598,249	434,252,198	4.85	5,403,749	31,748	85,786,000	145,074	271	2.28	618	938,073	2,054,441	
1921	90,473,451	452,304,903	5.00	4,677,368	8,894	81,950,000	159,499	271	2.09	567	979,145	2,027,790	
1922	54,683,022	273,700,125	5.01	2,649,457	233,528	56,799,000	156,849	151	2.31	349	502,793	949,745	
1923	93,339,009	506,786,768	5.43	5,090,138	300,360	86,914,000	157,743	268	2.21	592	1,208,542	2,263,098	
1924	87,926,862	477,230,852	5.43	4,017,785	117,951	80,717,000	160,009	274	2.00	550	1,423,884	1,865,677	
1925	61,817,149	327,664,512	5.30	3,179,006	382,894	64,061,000	160,312	182	2.12	386	941,189	1,578,478	
1926	84,437,452	474,164,252	5.62	4,029,683	813,956	77,221,000	165,386	244	2.09	511	931,650	2,401,356	

1927	80, 095, 564	420, 941, 726	5. 26	3, 325, 507	119, 030	74, 672, 000	165, 259	225	2. 15	485	1, 171, 888	2, 153, 156	[7] 2, 223, 281
1928	75, 348, 069	393, 637, 690	5. 22	3, 336, 272	384, 707	73, 650, 000	160, 681	217	2. 17	469	1, 289, 809	2, 422, 924	[7] 2, 351, 074
1929	73, 828, 195	385, 642, 751	5. 22	3, 406, 369	487, 172	71, 457, 000	151, 501	225	2. 16	487	1, 159, 910	1, 911, 766	3, 470, 158
1930	69, 384, 837	354, 574, 191	5. 11	2, 551, 659	674, 812	67, 628, 000	150, 804	208	2. 21	460	1, 410, 123	2, 536, 288	4, 467, 750
1931	59, 645, 652	296, 354, 586	4. 97	1, 778, 308	637, 951	58, 408, 000	139, 431	181	2. 37	428	1, 587, 265	3, 813, 237	4, 384, 780
1932	49, 855, 221	222, 375, 129	4. 46	1, 303, 355	607, 097	50, 500, 000	121, 243	162	2. 54	411	1, 674, 223	3, 980, 973	5, 433, 340
1933	49, 541, 344	206, 718, 405	4. 17	1, 034, 562	456, 252	49, 600, 000	104, 633	182	2. 60	473	1, 648, 249	4, 932, 069	6, 557, 267
1934	57, 168, 291	244, 152, 245	4. 27	1, 297, 610	478, 118	55, 500, 000	109, 050	207	2. 53	524	1, 981, 088	5, 798, 138	9, 284, 486
1935	52, 158, 783	210, 130, 565	4. 03	1, 608, 549	571, 439	51, 100, 000	103, 269	189	2. 68	505	1, 848, 095	5, 187, 072	9, 279, 057
1936	54, 579, 535	227, 003, 538	4. 16	1, 678, 024	614, 639	53, 200, 000	102, 081	192	2. 79	535	2, 162, 744	6, 203, 267	10, 827, 946
1937	51, 856, 433	197, 598, 849	3. 81	1, 914, 173	395, 737	50, 400, 000	99, 085	189	2. 77	523	1, 984, 512	5, 696, 018	10, 683, 837
1938	46, 099, 027	180, 600, 167	3. 92	1, 908, 911	362, 895	45, 200, 000	96, 417	171	2. 79	478	1, 588, 407	5, 095, 341	10, 151, 669
1939	51, 487, 377	187, 175, 324	3. 64	2, 590, 000	298, 153	49, 700, 000	93, 138	183	3. 02	553	1, 881, 884	5, 486, 479	11, 773, 833
1940	51, 484, 640	205, 489, 814	3. 99	2, 667, 632	135, 436	49, 000, 000	91, 313	186	3. 02	562	1, 816, 483	6, 352, 700	12, 326, 000
1941	[9] 56, 368, 267	240, 275, 126	4. 26	3, 380, 189	74, 669	52, 700, 000	88, 054	203	[10] 3. 04	[10] 617	1, 855, 422	7, 316, 574	13, 441, 987
1942	[9] 60, 327, 729	271, 673, 380	4. 50	4, 438, 588	140, 115	56, 500, 000	82, 121	239	[10] 2. 95	[10] 705	2, 285, 640	9, 070, 933	14, 741, 459
1943	[9] 60, 643, 620	306, 816, 018	5, 06	4, 138, 680	166, 020	57, 100, 000	79, 153	270	[10] 2. 78	[10] 751	1, 624, 883	8, 989, 387	14, 745, 793
1944	[9] 63, 701, 363	354, 582, 884	5. 57	4, 185, 933	11, 847	59, 400, 000	77, 591	292	[10] 2. 79	[10] 815	1, 336, 082	10, 953, 030	14, 975, 146
1945	[9] 54, 933, 909	323, 944, 435	5. 90	3, 691, 247	149	51, 600, 000	72, 842	269	[10] 2. 79	[10] 751	1, 210, 171	10, 056, 325	13, 927, 955
1946	[9] 60, 506, 873	413, 417, 070	6. 83	6, 497, 245	9, 556	53, 900, 000	78, 145	271	[10] 2. 84	[10] 770	1, 232, 828	12, 858, 930	15, 619, 162
1947	[9] 57, 190, 009	413, 019, 486	7. 22	8, 509, 995	10, 350	48, 200, 000	78, 600	259	[10] 2. 78	[10] 720	1, 209, 983	12, 603, 545	16, 054, 011
1948	[9] 57, 139, 948	467, 051, 800	8. 17	6, 675, 914	945	50, 200, 000	76, 215	265	[10] 2. 81	[10] 745	1, 016, 757	13, 352 874	15, 742, 368
1949	[9] 42, 701, 724	358, 008, 451	8. 38	4, 942 670	---------	37, 700, 000	75, 377	195	[10] 2. 87	[10] 560	557, 599	10, 376, 808	11, 858, 088
1950	[9] 44, 076, 703	392, 398, 006	8. 90	3, 891, 569	18, 289	39, 900, 000	72, 624	211	[10] 2. 83	[10] 597	611, 734	11, 833, 934	12, 335, 650

[1] "Bootleg" operations not included, except as indicated in footnote 9.
[2] U. S. Department of Commerce.
[3] Before 1913 the figures of consumption take no account of producers' stocks, there being no data available for this item.
[4] Data first collected in 1911.
[5] Data first collected in 1915.
[6] Data first collected in 1929.
[7] As reported by the Commonwealth of Pennsylvania, Department of Mines.
[8] Calculated on basis of Pennsylvania Department of Mines employment data.
[9] Includes some "bootleg" coal purchased by legitimate operators and prepared at their breakers.
[10] Output per man calculated on legitimate tonnages only; "bootleg" purchases excluded.

TABLE 4.—Standard anthracite specifications approved and adopted by the Anthracite Committee effective July 28, 1947 [1]

	Round test mesh, inches	Percent					
		Oversize, maximum	Undersize [2]		Maximum impurities [3]		
			Maximum	Minimum	Slate [4]	Bone or ash [5]	
Broken	Through 4⅜				1½	2	11
	Over 3¼ to 3		15	7½			
Egg	Through 3¼ to 3	5			1½	2	11
	Over 2⁷⁄₁₆		15	7½			
Stove	Through 2⁷⁄₁₆	7½			2	3	11
	Over 1⅝		15	7½			
Chestnut	Through 1⅝	7½			3	4	11
	Over 1³⁄₁₆		15	7½			
Pea	Through 1³⁄₁₆	10			4	5	12
	Over ⁹⁄₁₆		15	7½			
Buckwheat No. 1	Through ⁹⁄₁₆	10					13
	Over ⁵⁄₁₆		15	7½			
Buckwheat No. 2 (Rice)	Through ⁵⁄₁₆	10					13
	Over ³⁄₁₆		17	7½			
Buckwheat No. 3 (Barley)	Through ³⁄₁₆	10					15
	Over ³⁄₃₂		20	10			
Buckwheat No. 4	Through ³⁄₃₂	20					15
	Over ³⁄₆₄		30	10			
Buckwheat No. 5	Through ³⁄₆₄	30	No limit				16

[1] A tolerance of 1 percent is allowed on the maximum percentage of undersize and the maximum percentage of ash content.
[2] The maximum percentage of undersize is applicable only to anthracite as it is produced at the preparation plant.
[3] When the slate content in the sizes from Broken to Chestnut, inclusive, is less than these standards, bone content may be increased by 1½ times the decrease in the slate content under the allowable limits, but specified slate content shall not be exceeded in any event.
[4] Slate is defined as any material that has less than 40 percent fixed carbon.
[5] Bone is defined as any material that has 40 percent or more, but less than 75 percent fixed carbon. Ash determinations are on a dry basis.

with local authorities in communities where smoke-abatement regulations are contemplated or are already in force.

The institute continued its extensive research program. (*See* Technology section of this chapter.)

Labor Relations.—There were no serious labor disturbances in the anthracite industry in 1950. The 3-day week that had prevailed since December 5, 1949, was terminated March 4, 1950. An agreement replacing the amended contract of July 3, 1948, between the United Mine Workers and the anthracite operators became effective March 16, 1950. Under terms of this accord, the royalty on each ton of anthracite produced was increased from 20 cents per ton to 30 cents, and substantial wage increases were granted the miners. On January 26, 1951, after 3 days of negotiations, a further contract was drawn up whereby the miners received an additional daily wage increase of $1.60 across the board, effective February 1, 1951. The new agreement may be terminated by either party, on or after March 31, 1952, by giving 60 days' written notice.

Sources and Acknowledgments.—Basic statistics of the Pennsylvania anthracite-mining industry in this chapter are prepared from a canvass, by mail, of all known anthracite operations; about 99 percent of the tonnage is reported directly by producers, and the remaining 1 percent is estimated on collateral evidence. The data on individual operations furnished by the producers are voluntary and confidential, as is customary in the statistical services of the Bureau of Mines. In assembling available detailed information, free use has been made of the pertinent statistics prepared by the Pennsylvania Department of Mines, the Anthracite Institute, the Anthracite Committee, and the Association of American Railroads; thanks are extended to all of them for their cordial and continued cooperation.

PRODUCTION

The production of Pennsylvania anthracite in 1950 increased 3 percent over 1949. These statistics include deep-mined and strip-pit output, coal recovered from culm banks, anthracite purchased by the industry from so-called "bootleggers," and river or creek coal recovered from the streams draining the anthracite fields. A small tonnage of semianthracite (26,690 tons in 1950) produced in Sullivan County is also included.

"Breakers" and "Washeries".—As fresh-mined anthracite is brought to the surface it ranges in size from large lumps to fine dust and contains refuse and other impurities such as rock. In preparing the coal for market this "run-of-mine" material passes through a "breaker," or preparation plant equipped with complete crushing and screening facilities, where the large lumps are crushed and the impurities and refuse removed. The crushed coal is then washed and screened into various sizes for shipment to market.

In the early days of anthracite mining, large quantities of the smaller sizes were not marketable; and consequently, they were piled in large "culm" or refuse banks. As equipment was developed to burn the smaller sizes, "washeries" or small preparation plants equipped with facilities to screen and wash small sizes of anthracite were erected near the culm banks. Some culm-bank coal is also prepared at the breakers. Smaller sizes are currently in great demand, and little of the small-size coal is now dumped on refuse banks. The old banks are rapidly being depleted of marketable coal and will cease to be a source of marketable anthracite in the near future.

"Bootleg" Coal.—Before 1941, that anthracite referred to as "bootleg" coal was not included in production statistics of the Pennsylvania anthracite industry compiled by the Bureau of Mines. In 1941, however, the industry began to purchase run-of-mine coal from the so-called "bootleggers" for preparation and shipment to market. In 1950 these purchases totaled 600,529 net tons. As it is impractical to segregate the purchased anthracite in most instances from the output of the industry proper, it is included in the various production tables in the Minerals Yearbook chapters on Pennsylvania anthracite for 1941–50. To compute the output per man per day for the anthracite industry, it is necessary to deduct these purchases from the total tonnage shipped by the industry proper, because adequate data on man-days required to produce the "bootleg" coal are not available. Details on this procedure are discussed in the Employment section of this chapter.

The anthracite industry has continued its efforts to bring about elimination of anthracite bootlegging. Through subcontracting and leasing of coal lands to small independents the volume of "bootleg" coal has been reduced materially. See tables 5 and 6 for data on "bootleg" coal. For production and shipments by fields, regions, and counties, see tables 7 to 12. Tables 13 and 14 show percentages, by regions, of various sizes in relation to total breaker product.

TABLE 5.—Production, purchases by recognized operators, and fatalities at "bootleg" operations in the Pennsylvania anthracite industry, 1941–50

Year	Production (net tons) [1]	Purchased for preparation by recognized operations (net tons) [2]	Number of fatalities [1]	Year	Production (net tons) [1]	Purchased for preparation by recognized operations (net tons) [2]	Number of fatalities [1]
1941	6,300,000	1,902,481	61	1946	1,448,529	352,112	19
1942	3,931,000	2,616,839	45	1947	1,634,635	604,060	15
1943	1,912,467	1,265,617	22	1948	1,839,227	544,475	12
1944	1,332,957	506,842	21	1949	1,257,218	442,541	9
1945	1,026,000	260,342	16	1950	2,125,753	600,529	11

[1] Anthracite Committee, Harrisburg, Pa.
[2] As reported to Bureau of Mines, U. S. Department of the Interior.

TABLE 6.—Number of men employed in "bootleg" operations in the Pennsylvania anthracite industry, 1941–50

[Anthracite Committee, Harrisburg, Pa.]

Date of survey	Number of "bootleg" operations	Number of men employed	Date of survey	Number of "bootleg" operations	Number of men employed
Mar. 31, 1941	3,006	10,762	Mar. 7, 1945	502	1,806
May 1, 1942	2,029	7,554	Mar. 30, 1946	526	1,939
Dec. 15, 1942	1,363	4,967	Mar. 31, 1947	863	2,817
Apr. 20, 1943	1,065	3,607	Mar. 31, 1948	835	2,825
Oct. 14, 1943	791	2,725	Mar. 31, 1949	772	2,617
Mar. 31, 1944	652	2,220	Feb. 28, 1950	868	2,928

TABLE 7.—Pennsylvania anthracite produced, 1946–50, by field and type of plant, in net tons

[The figures of breaker product include a certain quantity of culm-bank coal, which amounted to 2,477,860 tons in 1950]

Field and type of plant	1946	1947	1948	1949	1950
Eastern Middle:					
Breakers	5,057,619	4,270,240	4,467,628	3,379,672	3,094,587
Washeries	282,481	315,014	298,601	238,532	195,387
Total Eastern Middle	5,340,100	4,585,254	4,766,229	3,618,204	3,289,974
Western Middle:					
Breakers	13,040,147	12,147,528	12,405,178	9,636,954	10,755,416
Washeries	530,246	591,652	240,157	135,670	----------
Dredges	362,423	411,804	311,183	246,905	197,812
Total Western Middle	13,932,816	13,150,984	12,956,518	10,019,529	10,953,228
Southern:					
Breakers	11,817,427	11,643,971	11,622,538	8,776,671	8,660,440
Washeries	1,386,125	237,131	496,194	484,595	439,934
Dredges	761,131	796,174	664,350	603,217	406,002
Total Southern	13,964,683	12,677,276	12,783,082	9,864,483	9,506,376
Northern:					
Breakers	26,227,918	25,831,439	25,839,648	18,579,955	19,930,556
Washeries	925,427	890,368	719,676	584,463	354,129
Dredges	8,840	11,728	12,471	15,000	15,750
Total Northern	27,162,185	26,733,535	26,571,795	19,179,418	20,300,435
Total, excluding Sullivan County:					
Breakers	56,143,111	53,893,178	54,334,992	40,373,252	42,440,999
Washeries	3,124,279	2,034,165	1,754,628	1,443,260	989,450
Dredges	1,132,394	1,219,706	988,004	865,122	619,564
Total, excluding Sullivan County	60,399,784	57,147,049	57,077,624	42,681,634	44,050,013
Sullivan County: [1]					
Breakers	85,402	[2] 42,960	62,324	20,090	26,690
Washeries	21,687	([2])	----------	----------	----------
Total Sullivan County	107,089	42,960	62,324	20,090	26,690
Grand total	60,506,873	57,190,009	57,139,948	42,701,724	44,076,703

[1] For purposes of historical comparison and statistical convenience, the mines of Sullivan County are grouped with the Pennsylvania anthracite region, although the product is classified as semianthracite according to the American Society for Testing Materials Tentative Standard.
[2] Small quantity of washery coal included with breaker.

TABLE 8.—Pennsylvania anthracite shipped outside producing region, sold locally, and used as colliery fuel in 1950, by regions

Region and type of plant	Shipments outside region		Local sales		Colliery fuel		Total	
	Net tons	Value [1]	Net tons	Value	Net tons	Value	Net tons	Value [1]
Lehigh:								
Breakers	6,306,056	$57,188,086	361,760	$3,609,215	158,896	$1,035,234	6,826,712	$61,832,535
Washeries	233,752	645,552					233,752	645,552
Dredges	21,877	43,899					21,877	43,899
Total Lehigh	6,561,685	57,877,537	361,760	3,609,215	158,896	1,035,234	7,082,341	62,521,986
Schuylkill:								
Breakers	14,600,697	124,310,197	879,127	6,432,551	203,907	503,768	15,683,731	131,246,516
Washeries	397,293	1,252,177	4,105	12,592	171	255	401,569	1,265,024
Dredges	466,862	1,287,894	115,075	315,570			581,937	1,603,464
Total Schuylkill	15,464,852	126,850,268	998,307	6,760,713	204,078	504,023	16,667,237	134,115,004
Wyoming:								
Breakers	16,735,349	170,150,738	2,442,511	21,815,937	752,696	2,546,650	19,930,556	194,513,325
Washeries	251,496	741,232	102,633	246,666			354,129	987,898
Dredges			15,750	30,145			15,750	30,145
Total Wyoming	16,986,845	170,891,970	2,560,894	22,092,748	752,696	2,546,650	20,300,435	195,531,368
Total, excluding Sullivan County:								
Breakers	37,642,102	351,649,021	3,683,398	31,857,703	1,115,499	4,085,652	42,440,999	387,592,376
Washeries	882,541	2,638,961	106,738	259,258	171	255	989,450	2,898,474
Dredges	488,739	1,331,793	130,825	345,715			619,564	1,677,508
Total	39,013,382	355,619,775	3,920,961	32,462,676	1,115,670	4,085,907	44,050,013	392,168,358
Sullivan County:								
Breakers	16,762	143,804	9,928	85,844			26,690	229,648
Grand total:								
1950	39,030,144	355,763,579	3,930,889	32,548,520	1,115,670	4,085,907	44,076,703	392,398,006
1949	37,689,496	323,859,218	3,848,420	30,275,721	1,163,808	3,873,512	42,701,724	358,008,451
Percent change	+3.6	+9.9	+2.1	+7.5	−4.1	+5.5	+3.2	+9.6

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies.

TABLE 9.—Pennsylvania anthracite produced in 1950, classified as fresh-mined, culm bank, and river coal, and as breaker, washery, and dredge product, by regions, in net tons

Region and type of plant	From mines			From culm banks	From river dredging	Total
	Underground		Strip pits			
	Mechanically loaded	Hand loaded				
Lehigh:						
Breakers	411,858	3,926,536	2,356,001	132,317		6,826,712
Washeries				233,752		233,752
Dredges					21,877	21,877
Total Lehigh	411,858	3,926,536	2,356,001	366,069	21,877	7,082,341
Schuylkill:						
Breakers	1,178,189	5,694,341	6,679,235	2,131,966		15,683,731
Washeries				401,569		401,569
Dredges					581,937	581,937
Total Schuylkill	1,178,189	5,694,341	6,679,235	2,533,535	581,937	16,667,237
Wyoming:						
Breakers	10,745,603	6,174,555	2,798,698	211,700		19,930,556
Washeries				354,129		354,129
Dredges					15,750	15,750
Total Wyoming	10,745,603	6,174,555	2,798,698	565,829	15,750	20,300,435
Total, excluding Sullivan County:						
Breakers	12,335,650	15,795,432	11,833,934	2,475,983		42,440,999
Washeries				989,450		989,450
Dredges					619,564	619,564
Total	12,335,650	15,795,432	11,833,934	3,465,433	619,564	44,050,013
Sullivan County: Breakers		24,813		1,877		26,690
Grand total	12,335,650	15,820,245	11,833,934	3,467,310	619,564	44,076,703

TABLE 10.—Pennsylvania anthracite produced in 1950, classified as fresh-mined, culm bank, and river coal, and as breaker, washery, and dredge product, by fields, in net tons

Field and type of plant	From mines			From culm banks	From river dredging	Total
	Underground		Strip pits			
	Mechanically loaded	Hand loaded				
Eastern Middle:						
Breakers	411,858	1,333,441	1,314,018	35,270		3,094,587
Washeries				195,387		195,387
Total Eastern Middle	411,858	1,333,441	1,314,018	230,657		3,289,974
Western Middle:						
Breakers	839,560	4,223,355	4,303,741	1,388,760		10,755,416
Dredges					197,812	197,812
Total Western Middle	839,560	4,223,355	4,303,741	1,388,760	197,812	10,953,228
Southern:						
Breakers	338,629	4,064,081	3,417,477	840,253		8,660,440
Washeries				439,934		439,934
Dredges					406,002	406,002
Total Southern	338,629	4,064,081	3,417,477	1,280,187	406,002	9,506,376
Northern:						
Breakers	10,745,603	6,174,555	2,798,698	211,700		19,930,556
Washeries				354,129		354,129
Dredges					15,750	15,750
Total Northern	10,745,603	6,174,555	2,798,698	565,829	15,750	20,300,435
Total, excluding Sullivan County:						
Breakers	12,335,650	15,795,432	11,833,934	2,475,983		42,440,999
Washeries				989,450		989,450
Dredges					619,564	619,564
Total	12,335,650	15,795,432	11,833,934	3,465,433	619,564	44,050,013
Sullivan County: Breakers		24,813		1,877		26,690
Grand total	12,335,650	15,820,245	11,833,934	3,467,310	619,564	44,076,703

TABLE 11.—Pennsylvania anthracite shipped in 1950, by regions and sizes

Size	Breaker shipments [1]								
	Lehigh region			Schuylkill region			Wyoming region		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [2] and Broken	23, 392	114	23, 506	38, 391	1, 948	40, 339	45, 469	22, 058	67, 527
Egg	227, 862	342	228, 204	505, 897	2, 374	508, 271	559, 804	4, 284	564, 088
Stove	1, 385, 688	8, 074	1, 393, 762	2, 643, 906	53, 194	2, 697, 100	4, 895, 550	100, 901	4, 996, 451
Chestnut	1, 432, 328	97, 344	1, 529, 672	3, 267, 632	160, 333	3, 427, 965	5, 223, 923	449, 443	5, 673, 366
Pea	500, 119	123, 768	623, 887	1, 152, 779	171, 891	1, 324, 670	1, 111, 775	760, 395	1, 872, 170
Total domestic	3, 569, 389	229, 642	3, 799, 031	7, 608, 605	389, 740	7, 998, 345	11, 836, 521	1, 337, 081	13, 173, 602
Buckwheat No. 1	851, 280	60, 768	912, 048	2, 124, 618	87, 117	2, 211, 735	2, 232, 472	391, 900	2, 624, 372
Buckwheat No. 2 (Rice)	501, 335	57, 300	558, 635	1, 258, 778	38, 238	1, 297, 016	1, 164, 790	248, 149	1, 412, 939
Buckwheat No. 3 (Barley)	617, 629	14, 037	631, 666	1, 744, 279	61, 878	1, 806, 157	1, 119, 734	373, 026	1, 492, 760
Buckwheat No. 4	381, 997	13	382, 010	900, 229	302, 055	1, 202, 284	194, 600	48, 042	242, 642
Other (including silt)	384, 426		384, 426	964, 188	99	964, 287	187, 232	44, 313	231, 545
Total steam	2, 736, 667	132, 118	2, 868, 785	6, 992, 092	489, 387	7, 481, 479	4, 898, 828	1, 105, 430	6, 004, 258
Grand total	6, 306, 056	361, 760	6, 667, 816	14, 600, 697	879, 127	15, 479, 824	16, 735, 349	2, 442, 511	19, 177, 860
VALUE									
Lump [2] and Broken	$286, 946	$1, 358	$288, 304	$466, 257	$24, 082	$490, 339	$550, 220	$253, 161	$803, 381
Egg	2, 780, 946	4, 479	2, 785, 425	6, 100, 936	29, 565	6, 130, 501	6, 732, 690	53, 488	6, 786, 178
Stove	17, 270, 410	103, 736	17, 374, 146	32, 243, 494	656, 266	32, 899, 760	59, 782, 135	1, 293, 020	61, 075, 155
Chestnut	17, 820, 955	1, 269, 855	19, 090, 810	39, 674, 351	1, 990, 166	41, 664, 517	63, 709, 062	5, 761, 629	69, 470, 691
Pea	5, 119, 058	1, 335, 110	6, 454, 168	11, 258, 447	1, 697, 028	12, 955, 475	11, 094, 503	8, 053, 471	19, 147, 974
Total domestic	43, 278, 315	2, 714, 538	45, 992, 853	89, 743, 485	4, 397, 107	94, 140, 592	141, 868, 610	15, 414, 769	157, 283, 379
Buckwheat No. 1	5, 873, 919	453, 828	6, 327, 747	14, 104, 667	587, 323	14, 691, 990	15, 248, 552	2, 857, 532	18, 106, 084
Buckwheat No. 2 (Rice)	2, 855, 934	368, 728	3, 224, 662	6, 962, 003	216, 090	7, 178, 093	6, 705, 459	1, 517, 048	8, 222, 507
Buckwheat No. 3 (Barley)	2, 779, 674	72, 065	2, 851, 739	7, 626, 789	300, 930	7, 927, 719	5, 130, 202	1, 789, 638	6, 919, 840
Buckwheat No. 4	1, 311, 478	56	1, 311, 534	2, 918, 093	930, 823	3, 848, 916	688, 483	148, 181	836, 664
Other (including silt)	1, 088, 766		1, 088, 766	2, 955, 160	278	2, 955, 438	509, 432	88, 769	598, 201
Total steam	13, 909, 771	894, 677	14, 804, 448	34, 566, 712	2, 035, 444	36, 602, 156	28, 282, 128	6, 401, 168	34, 683, 296
Grand total	57, 188, 086	3, 609, 215	60, 797, 301	124, 310, 197	6, 432, 551	130, 742, 748	170, 150, 738	21, 815, 937	191, 966, 675

For footnotes, see end of table.

TABLE 11.—Pennsylvania anthracite shipped in 1950, by regions and sizes—Continued

Size	Breaker shipments [1]								
	Lehigh region			Schuylkill region			Wyoming region		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
AVERAGE VALUE PER TON									
Lump [2] and Broken	$12.27	$11.91	$12.27	$12.14	$12.36	$12.16	$12.10	$11.48	$11.90
Egg	12.20	13.10	12.21	12.06	12.45	12.06	12.03	12.49	12.03
Stove	12.46	12.85	12.47	12.20	12.34	12.20	12.21	12.81	12.22
Chestnut	12.44	13.05	12.48	12.14	12.41	12.15	12.20	12.82	12.25
Pea	10.24	10.79	10.35	9.77	9.87	9.78	9.98	10.59	10.23
Total domestic	12.12	11.82	12.11	11.79	11.28	11.77	11.99	11.53	11.94
Buckwheat No. 1	6.90	7.47	6.94	6.64	6.74	6.64	6.83	7.29	6.90
Buckwheat No. 2 (Rice)	5.70	6.44	5.77	5.53	5.65	5.53	5.76	6.11	5.82
Buckwheat No. 3 (Barley)	4.50	5.13	4.51	4.37	4.86	4.39	4.58	4.80	4.64
Buckwheat No. 4	3.43	4.31	3.43	3.24	3.08	3.20	3.54	3.08	3.45
Other (including silt)	2.83		2.83	3.06	2.81	3.06	2.72	2.00	2.58
Total steam	5.08	6.77	5.16	4.94	4.16	4.89	5.77	5.79	5.78
Grand total	9.07	9.98	9.12	8.51	7.32	8.45	10.17	8.93	10.01

For footnotes, see end of table.

Size	Breaker shipments [1]—Continued								
	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [2] and Broken	---------	---------	---------	107, 252	24, 120	131, 372	107, 252	24, 120	131, 372
Egg	---------	---------	---------	1, 293, 563	7, 000	1, 300, 563	1, 293, 563	7, 000	1, 300, 563
Stove	2, 530	1, 688	4, 218	8, 925, 144	162, 169	9, 087, 313	8, 927, 674	163, 857	9, 091, 531
Chestnut	4, 286	2, 482	6, 768	9, 923, 883	707, 120	10, 631, 003	9, 928, 169	709, 602	10, 637, 771
Pea	3, 429	1, 986	5, 415	2, 764, 673	1, 056, 054	3, 820, 727	2, 768, 102	1, 058, 040	3, 826, 142
Total domestic	10, 245	6, 156	16, 401	23, 014, 515	1, 956, 463	24, 970, 978	23, 024, 760	1, 962, 619	24, 987, 379
Buckwheat No. 1	2, 744	1, 588	4, 332	5, 208, 370	539, 785	5, 748, 155	5, 211, 114	541, 373	5, 752, 487
Buckwheat No. 2 (Rice)	---------	---------	---------	2, 924, 903	343, 687	3, 268, 590	2, 924, 903	343, 687	3, 268, 590
Buckwheat No. 3 (Barley)	---------	---------	---------	3, 481, 642	448, 941	3, 930, 583	3, 481, 642	448, 941	3, 930, 583
Buckwheat No. 4	---------	---------	---------	1, 476, 826	350, 110	1, 826, 936	1, 476, 826	350, 110	1, 826, 936
Other (including silt)	3, 773	2, 184	5, 957	1, 535, 846	44, 412	1, 580, 258	1, 539, 619	46, 596	1, 586, 215
Total steam	6, 517	3, 772	10, 289	14, 627, 587	1, 726, 935	16, 354, 522	14, 634, 104	1, 730, 707	16, 364, 811
Grand total	16, 762	9, 928	26, 690	37, 642, 102	3, 683, 398	41, 325, 500	37, 658, 864	3, 693, 326	41, 352, 190
VALUE									
Lump [2] and Broken	---------	---------	---------	$1, 303, 423	$278, 601	$1, 582, 024	$1, 303, 423	$278, 601	$1, 582, 024
Egg	---------	---------	---------	15, 614, 572	87, 532	15, 702, 104	15, 614, 572	87, 532	15, 702, 104
Stove	$29, 696	$19, 813	$49, 509	109, 296, 039	2, 053, 022	111, 349, 061	109, 325, 735	2, 072, 835	111, 398, 570
Chestnut	49, 293	28, 542	77, 835	121, 204, 368	9, 021, 650	130, 226, 018	121, 253, 661	9, 050, 192	130, 303, 853
Pea	32, 576	18, 862	51, 438	27, 472, 008	11, 085, 609	38, 557, 617	27, 504, 584	11, 104, 471	38, 609, 055
Total domestic	111, 565	67, 217	178, 782	274, 890, 410	22, 526, 414	297, 416, 824	275, 001, 975	22, 593, 631	297, 595, 606
Buckwheat No. 1	17, 148	9, 928	27, 076	35, 227, 138	3, 898, 683	39, 125, 821	35, 244, 286	3, 908, 611	39, 152, 897
Buckwheat No. 2 (Rice)	---------	---------	---------	16, 523, 396	2, 101, 866	18, 625, 262	16, 523, 396	2, 101, 866	18, 625, 262
Buckwheat No. 3 (Barley)	---------	---------	---------	15, 536, 665	2, 162, 633	17, 699, 298	15, 536, 665	2, 162, 633	17, 699, 298
Buckwheat No. 4	---------	---------	---------	4, 918, 054	1, 079, 060	5, 997, 114	4, 918, 054	1, 079, 060	5, 997, 114
Other (including silt)	15, 091	8, 699	23, 790	4, 553, 358	89, 047	4, 642, 405	4, 568, 449	97, 746	4, 666, 195
Total steam	32, 239	18, 627	50, 866	76, 758, 611	9, 331, 289	86, 089, 900	76, 790, 850	9, 349, 916	86, 140, 766
Grand total	143, 804	85, 844	229, 648	351, 649, 021	31, 857, 703	383, 506, 724	351, 792, 825	31, 943, 547	383, 736, 372

For footnotes, see end of table.

232294—53——24

TABLE 11.—Pennsylvania anthracite shipped in 1950, by regions and sizes—Continued

Size	Breaker shipments [1]—Continued								
	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
AVERAGE VALUE PER TON									
Lump [2] and Broken				$12.15	$11.55	$12.04	$12.15	$11.55	$12.04
Egg				12.07	12.50	12.07	12.07	12.50	12.07
Stove	$11.74	$11.74	$11.74	12.25	12.66	12.25	12.25	12.65	12.25
Chestnut	11.50	11.50	11.50	12.21	12.76	12.25	12.21	12.75	12.25
Pea	9.50	9.50	9.50	9.94	10.50	10.09	9.94	10.50	10.09
Total domestic	10.89	10.92	10.90	11.94	11.51	11.91	11.94	11.51	11.91
Buckwheat No. 1	6.25	6.25	6.25	6.76	7.22	6.81	6.76	7.22	6.81
Buckwheat No. 2 (Rice)				5.65	6.12	5.70	5.65	6.12	5.70
Buckwheat No. 3 (Barley)				4.46	4.82	4.50	4.46	4.82	4.50
Buckwheat No. 4				3.33	3.08	3.28	3.33	3.08	3.28
Other (including silt)	4.00	3.98	3.99	2.96	2.01	2.94	2.97	2.10	2.94
Total steam	4.95	4.94	4.94	5.25	5.40	5.26	5.25	5.40	5.26
Grand total	8.58	8.65	8.60	9.34	8.65	9.28	9.34	8.65	9.28

For footnotes, see end of table.

Size	Washery shipments			Dredge shipments			Grand total		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
NET TONS									
Lump [3] and Broken							107,252	24,120	131,372
Egg							1,293,563	7,000	1,300,563
Stove							8,927,674	163,857	9,091,531
Chestnut	403	156	559				9,928,572	709,758	10,638,330
Pea	281	80	361		1,120	1,120	2,768,383	1,059,240	3,827,623
Total domestic	684	236	920		1,120	1,120	23,025,444	1,963,975	24,989,419
Buckwheat No. 1	5,685		5,685	5,837	1,126	6,963	5,222,636	542,499	5,765,135
Buckwheat No. 2 (Rice)	10,286		10,286	5,974	7,974	13,948	2,941,163	351,661	3,292,824
Buckwheat No. 3 (Barley)	55,420	44	55,464	97,203	34,523	131,726	3,634,265	483,508	4,117,773
Buckwheat No. 4	263,441	67,392	330,833	95,456	31,937	127,393	1,835,723	449,439	2,285,162
Other (including silt)	547,025	39,066	586,091	284,269	54,145	338,414	2,370,913	139,807	2,510,720
Total steam	881,857	106,502	988,359	488,739	129,705	618,444	16,004,700	1,966,914	17,971,614
Grand total	882,541	106,738	989,279	488,739	130,825	619,564	39,030,144	3,930,889	42,961,033
VALUE									
Lump [3] and Broken							$1,303,423	$278,601	$1,582,024
Egg							15,614,572	87,532	15,702,104
Stove							109,325,735	2,072,835	111,398,570
Chestnut	$4,477	$1,560	$6,037				121,258,138	9,051,752	130,309,890
Pea	2,669	720	3,389		$6,150	$6,150	27,507,253	11,111,341	38,618,594
Total domestic	7,146	2,280	9,426		6,150	6,150	275,009,121	22,602,061	297,611,182
Buckwheat No. 1	30,705		30,705	$37,302	4,530	41,832	35,312,293	3,913,141	39,225,434
Buckwheat No. 2 (Rice)	54,797		54,797	32,320	24,984	57,304	16,610,513	2,126,850	18,737,363
Buckwheat No. 3 (Barley)	216,960	175	217,135	290,455	80,542	370,997	16,044,080	2,243,350	18,287,430
Buckwheat No. 4	809,607	131,792	941,399	286,531	80,643	367,174	6,014,192	1,291,495	7,305,687
Other (including silt)	1,519,746	125,011	1,644,757	685,185	148,866	834,051	6,773,380	371,623	7,145,003
Total steam	2,631,815	256,978	2,888,793	1,331,793	339,565	1,671,358	80,754,458	9,946,459	90,700,917
Grand total	2,638,961	259,258	2,898,219	1,331,793	345,715	1,677,508	355,763,579	32,548,520	388,312,099

For footnotes, see end of table.

TABLE 11.—Pennsylvania anthracite shipped in 1950, by regions and sizes—Continued

Size	Washery shipments			Dredge shipments			Grand total		
	Outside region	Local sales	Total	Outside region	Local sales	Total	Outside region	Local sales	Total
AVERAGE VALUE PER TON									
Lump [2] and Broken							$12.15	$11.55	$12.04
Egg							12.07	12.50	12.07
Stove							12.25	12.65	12.25
Chesnut	$11.11	$10.00	$10.80				12.21	12.75	12.25
Pea	9.50	9.00	9.39		5.49	5.49	9.94	10.49	10.09
Total domestic	10.45	9.66	10.25		5.49	5.49	11.94	11.51	11.91
Buckwheat No. 1	5.40		5.40	$6.39	4.02	6.01	6.76	7.21	6.80
Buckwheat No. 2 (Rice)	5.33		5.33	5.41	3.13	4.11	5.65	6.05	5.69
Buckwheat No. 3 (Barley)	3.91	3.98	3.91	2.99	2.33	2.82	4.41	4.64	4.44
Buckwheat No. 4	3.07	1.96	2.85	3.00	2.53	2.88	3.28	2.87	3.20
Other (including silt)	2.78	3.20	2.81	2.41	2.75	2.46	2.86	2.66	2.85
Total steam	2.98	2.41	2.92	2.72	2.62	2.70	5.05	5.06	5.05
Grand total	2.99	2.43	2.93	2.72	2.64	2.71	9.12	8.28	9.04

[1] Figures of shipments from breakers include some culm-bank coal handled in breakers.

[2] Quantity of Lump included is insignificant.

TABLE 12.—Pennsylvania anthracite produced in 1950, by counties

County	Shipments outside producing regions		Sold to local trade		Colliery fuel		Total production	
	Net tons	Value [1]	Net tons	Value	Net tons	Value	Net tons	Value [1]
Carbon	2,087,450	$18,511,930	38,713	$387,389	54,403	$436,071	2,180,566	$19,335,390
Columbia	1,058,105	10,326,945	44,057	322,128	19,715	47,835	1,121,877	10,696,908
Dauphin and Susquehanna	101,692	267,489	41,944	122,167			143,636	389,656
Lackawanna	5,209,143	50,360,420	942,883	9,055,798	320,562	1,129,812	6,472,588	60,546,030
Lancaster, Lebanon, Northampton, and Snyder [2]	263,588	663,150	26,795	78,998			290,383	742,148
Luzerne	14,021,825	141,488,211	1,839,182	15,261,117	503,969	1,771,126	16,364,976	158,520,454
Northumberland	4,498,087	34,812,183	378,690	2,387,077	42,322	79,339	4,919,099	37,278,599
Schuylkill	11,773,492	99,189,447	608,697	4,848,002	174,699	621,724	12,556,888	104,659,173
Sullivan	16,762	143,804	9,928	85,844			26,690	229,648
Total	39,030,144	355,763,579	3,930,889	32,548,520	1,115,670	4,085,907	44,076,703	392,398,006

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies.
[2] Counties producing dredge coal only.

TABLE 13.—Sizes of Pennsylvania anthracite shipped from breakers to points outside and inside producing region in 1950, by regions, in percent of total

[Note that shipments of dredge and washery coal are not included]

Size	Percent of total shipments								
	Lehigh region			Schuylkill region			Wyoming region		
	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total
Lump [1] and Broken	0.4	(2)	0.4	0.2	0.2	0.3	0.3	0.9	0.3
Egg	3.6	0.1	3.4	3.5	.3	3.3	3.3	.2	2.9
Stove	22.0	2.3	20.9	18.1	6.0	17.4	29.3	4.1	26.1
Chestnut	22.7	26.9	22.9	22.4	18.2	22.1	31.2	18.4	29.6
Pea	7.9	34.2	9.4	7.9	19.6	8.6	6.6	31.1	9.8
Total domestic	56.6	63.5	57.0	52.1	44.3	51.7	70.7	54.7	68.7
Buckwheat No. 1	13.5	16.8	13.7	14.6	9.9	14.3	13.3	16.1	13.7
Buckwheat No. 2 (Rice)	7.9	15.8	8.4	8.6	4.4	8.4	7.0	10.2	7.4
Buckwheat No. 3 (Barley)	9.8	3.9	9.5	11.9	7.0	11.7	6.7	15.2	7.8
Buckwheat No. 4	6.1	(2)	5.7	6.2	34.4	7.7	1.2	2.0	1.2
Other (including silt)	6.1		5.7	6.6	(2)	6.2	1.1	1.8	1.2
Total steam	43.4	36.5	43.0	47.9	55.7	48.3	29.3	45.3	31.3
All sizes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Size	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
Lump [1] and Broken				0.3	0.6	0.3	0.3	0.7	0.3
Egg				3.4	.2	3.2	3.4	.2	3.1
Stove	15.1	17.0	15.8	23.7	4.4	22.0	23.7	4.4	22.0
Chestnut	25.5	25.0	25.3	26.4	19.2	25.7	26.4	19.2	25.7
Pea	20.5	20.0	20.3	7.3	28.7	9.2	7.3	28.6	9.3
Total domestic	61.1	62.0	61.4	61.1	53.1	60.4	61.1	53.1	60.4
Buckwheat No. 1	16.4	16.0	16.3	13.8	14.7	13.9	13.8	14.7	13.9
Buckwheat No. 2 (Rice)				7.8	9.3	7.9	7.8	9.3	7.9
Buckwheat No. 3 (Barley)				9.3	12.2	9.5	9.3	12.1	9.5
Buckwheat No. 4				3.9	9.5	4.4	3.9	9.5	4.4
Other (including silt)	22.5	22.0	22.3	4.1	1.2	3.9	4.1	1.3	3.9
Total steam	38.9	38.0	38.6	38.9	46.9	39.6	38.9	46.9	39.6
All sizes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Quantity of Lump included is insignificant.
[2] Less than 0.05 percent.

TABLE 14.—Sizes of Pennsylvania anthracite shipped from breakers to points outside producing region, 1946–50, by regions, in percent of total

[Note that shipments of dredge and washery coal are not included]

Size	Percent of total shipments									
	Lehigh region					Schuylkill region				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
Lump [1] and Broken	0.6	0.7	0.8	0.4	0.4	0.1	0.7	0.7	0.3	0.2
Egg	6.5	5.0	5.7	2.9	3.6	5.2	5.3	5.8	3.1	3.5
Stove	19.2	20.0	20.5	20.6	22.0	17.1	15.9	16.5	17.5	18.1
Chestnut	21.5	21.7	21.6	22.8	22.7	22.7	21.2	21.0	22.3	22.4
Pea	8.2	8.2	8.2	7.7	7.9	8.2	7.6	8.0	8.3	7.9
Total domestic	56.0	55.6	56.8	54.4	56.6	53.3	50.7	52.0	51.5	52.1
Buckwheat No. 1	13.7	13.5	13.0	13.1	13.5	15.0	14.1	14.0	14.2	14.6
Buckwheat No. 2 (Rice)	9.2	8.7	8.6	8.1	7.9	8.5	8.6	8.7	8.9	8.6
Buckwheat No. 3 (Barley)	10.4	10.1	9.3	9.7	9.8	13.9	14.6	14.4	12.6	11.9
Buckwheat No. 4	3.3	5.6	6.4	7.9	6.1	6.8	9.0	6.8	6.3	6.2
Other (including silt)	7.4	6.5	5.9	6.8	6.1	2.5	3.0	4.1	6.5	6.6
Total steam	44.0	44.4	43.2	45.6	43.4	46.7	49.3	48.0	48.5	47.9
All sizes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Size	Wyoming region					Sullivan County				
Lump [1] and Broken	0.2	0.3	0.2	0.2	0.3					
Egg	7.3	6.5	6.3	3.4	3.3					
Stove	27.2	27.0	28.3	29.4	29.3	18.9	8.5	20.5	32.0	15.1
Chestnut	30.0	29.5	29.4	31.7	31.2	20.8	29.7	30.9	38.0	25.5
Pea	6.5	6.8	6.5	6.7	6.6	12.3	15.4	10.9	10.0	20.5
Total domestic	71.2	70.1	70.7	71.4	70.7	52.0	53.6	62.3	80.0	61.1
Buckwheat No. 1	12.9	13.1	12.7	13.4	13.3	16.4	10.2	8.0	2.1	16.4
Buckwheat No. 2 (Rice)	6.5	6.5	6.8	7.0	7.0	30.2	.6			
Buckwheat No. 3 (Barley)	6.3	6.8	6.5	6.0	6.7					
Buckwheat No. 4	2.1	1.7	1.4	1.1	1.2					
Other (including silt)	1.0	1.8	1.9	1.1	1.1	1.4	35.6	29.7	17.9	22.5
Total steam	28.8	29.9	29.3	28.6	29.3	48.0	46.4	37.7	20.0	38.9
All sizes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Size	Total									
	Excluding Sullivan County					Including Sullivan County				
Lump [1] and Broken	0.3	0.5	0.5	0.2	0.3	0.3	0.5	0.5	0.2	0.3
Egg	6.3	5.8	6.0	3.2	3.4	6.3	5.8	6.0	3.2	3.4
Stove	22.0	21.7	22.5	23.2	23.7	22.0	21.7	22.5	23.2	23.7
Chestnut	25.8	25.1	24.9	26.5	26.4	25.8	25.1	24.9	26.5	26.4
Pea	7.4	7.3	7.4	7.5	7.3	7.4	7.3	7.4	7.5	7.3
Total domestic	61.8	60.4	61.3	60.6	61.1	61.8	60.4	61.3	60.6	61.1
Buckwheat No. 1	13.9	13.5	13.3	13.7	13.8	13.9	13.5	13.3	13.7	13.8
Buckwheat No. 2 (Rice)	7.8	7.7	7.8	7.9	7.8	7.8	7.7	7.8	7.9	7.8
Buckwheat No. 3 (Barley)	9.8	10.3	9.9	9.2	9.3	9.8	10.2	9.9	9.2	9.3
Buckwheat No. 4	4.0	5.1	4.3	4.4	3.9	4.0	5.1	4.3	4.4	3.9
Other (including silt)	2.7	3.0	3.4	4.2	4.1	2.7	3.1	3.4	4.2	4.1
Total steam	38.2	39.6	38.7	39.4	38.9	38.2	39.6	38.7	39.4	38.9
All sizes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Quantity of Lump included is insignificant.

By Weeks and Months.—Weekly production figures for anthracite as published in the Bureau of Mines Weekly Anthracite and Beehive Coke reports are estimated from records of railroad carloadings and from reports obtained from trade sources. The weekly and monthly figures so obtained have been adjusted in tables 15 and 16 to the total annual anthracite production as obtained by a direct mail canvass of the operators.

TABLE 15.—Estimated weekly production of Pennsylvania anthracite in 1950 [1]

Week ended—	Thousand net tons	Week ended—	Thousand net tons	Week ended—	Thousand net tons	Week ended—	Thousand net tons
Jan. 7	398	Apr. 15	772	July 15	781	Oct. 21	977
14	655	22	733	22	849	28	1,048
21	727	29	986	29	958	Nov. 4	583
28	721	May 6	946	Aug. 5	928	11	781
Feb. 4	698	13	992	12	955	18	848
11	696	20	972	19	954	25	687
18	612	27	1,035	26	952	Dec. 2	841
25	616	June 3	690	Sept. 2	954	9	746
Mar. 4	657	10	857	9	763	16	847
11	1,193	17	880	16	917	23	904
18	1,206	24	943	23	949	30	642
25	1,130	July 1	1,117	30	1,030		
Apr. 1	1,024	8	48	Oct. 7	996	Total	44,077
8	810			14	1,073		

[1] Estimated from weekly carloadings as reported by the Association of American Railroads. Adjusted to annual production total from Bureau of Mines canvass.

TABLE 16.—Estimated monthly production of Pennsylvania anthracite, 1943–50, in thousands of net tons [1]

Month	1943	1944	1945	1946	1947	1948	1949	1950
January	4,466	4,970	4,219	4,968	5,172	4,929	3,725	2,893
February	5,203	5,811	4,471	4,774	4,254	4,682	2,930	2,563
March	5,855	5,512	5,269	5,476	4,984	4,935	2,375	4,847
April	5,337	5,141	5,124	5,069	4,293	4,445	3,725	3,331
May	5,219	5,781	2,083	5,453	4,564	4,874	4,407	4,228
June	3,244	5,558	5,667	3,625	4,624	4,597	3,406	4,166
July	5,698	4,905	4,944	5,248	4,098	4,372	3,925	2,855
August	5,653	5,558	4,656	5,428	5,011	5,129	3,710	4,386
September	5,474	5,380	4,640	5,033	5,158	5,015	2,114	3,835
October	5,359	5,538	5,304	5,393	5,524	4,969	4,979	4,282
November	4,140	5,029	4,559	4,975	4,629	4,687	4,657	3,355
December	4,996	4,518	3,998	5,065	4,879	4,506	2,749	3,336
Total	60,644	63,701	54,934	60,507	57,190	57,140	42,702	44,077

[1] Estimated from weekly carloadings as reported by the Association of American Railroads. *See* table 15.

Culm-Bank Coal.—The recovery of anthracite from culm banks in 1950 declined 22 percent from 1949, and output from this source was the lowest since 1940. Under an extremely heavy demand for coal during World War II, anthracite recovered from culm banks reached a peak in 1944 but has been declining since that year. Over the past 30 years many culm banks have been depleted of recoverable anthracite, and it is expected that future output from this source will decline sharply. Tables 17 and 18 give details on production of anthracite from culm banks.

TABLE 17.—Production of Pennsylvania anthracite from culm banks, by regions, 1935–50, in net tons

Year	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1935	192,790	1,748,960	760,718		2,702,468
1936	136,058	2,532,116	525,798		3,193,972
1937	101,239	2,178,482	442,878		2,722,599
1938	53,037	1,941,896	345,511		2,340,444
1939	64,180	2,159,548	360,086		2,583,814
1940	192,878	2,109,557	480,603		2,783,038
1941	326,755	2,881,049	449,062		3,656,866
1942	745,934	3,529,757	459,373		4,735,064
1943	1,944,047	4,577,917	1,041,841	19,893	7,583,698
1944	2,125,317	5,787,036	1,673,994	13,833	9,600,180
1945	2,086,864	4,936,907	1,728,440	34,448	8,786,659
1946	1,875,590	4,752,141	1,780,874	22,487	8,431,092
1947	1,044,501	3,947,016	1,409,217	2,912	6,403,646
1948	796,114	3,729,542	1,098,123		5,623,779
1949	694,763	2,778,131	956,250		4,429,144
1950	366,069	2,533,535	565,829	1,877	3,467,310

TABLE 18.—Culm-bank coal put through breakers, 1946–50, by fields, in net tons

Year	Northern	Eastern Middle	Western Middle	Southern	Total
1946	[1] 856,247	708,012	1,902,369	1,845,163	5,311,791
1947	[2] 525,732	249,151	1,607,166	2,099,299	4,481,348
1948	393,787	152,827	1,871,847	1,571,119	3,989,580
1949	371,787	193,565	1,366,775	1,081,585	3,013,712
1950	[1] 213,577	35,270	1,388,760	840,253	2,477,860

[1] A small quantity of culm-bank coal was put through breakers in Sullivan County.
[2] Includes some washery coal.

MINING METHODS AND EQUIPMENT

Mechanical Loading.—The quantity of anthracite loaded mechanically underground increased 4 percent in 1950 over 1949. Mechanically loaded coal comprised 44 percent of the total underground production, the same percentage as in 1949. The coal beds of the Northern field are more adaptable to present-day mechanical loading methods, because of the relative flatness of the coal seams, than are the sharply pitching seams in the other fields; hence, 87 percent of the total tonnage loaded mechanically underground was produced in the Northern field compared with only 13 percent for the three other fields combined. Details on anthracite loaded mechanically underground are given in tables 19 to 21. The trend in underground mechanical loading, hand loading, and stripping of anthracite, 1928–50, is shown graphically in figure 1.

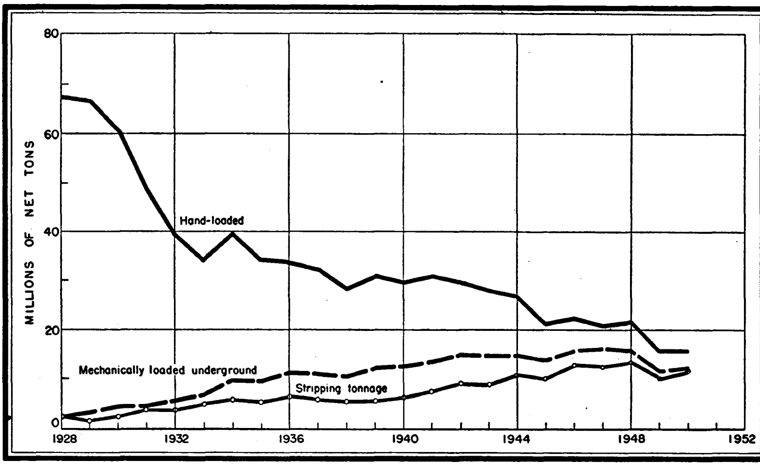

FIGURE 1.—Trends in mechanical loading, hand loading, and stripping of Pennsylvania anthracite, 1928–50.

TABLE 19.—Pennsylvania anthracite loaded mechanically, underground, 1946–50

Year	Scrapers		Mobile loaders		Conveyors and pit-car loaders [1]		Total loaded mechanically	
	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded
1946	564	2,714,051	27	81,545	3,233	12,823,566	3,824	15,619,162
1947	594	2,371,370	25	132,237	3,457	13,550,404	4,076	16,054,011
1948	643	2,721,180	19	60,657	3,562	12,960,531	4,224	15,742,368
1949	589	1,950,503	27	80,104	3,618	9,827,481	4,234	11,858,088
1950	556	1,900,185	30	89,191	3,460	10,346,274	4,046	12,335,650

[1] Includes duckbills and other self-loading conveyors.

TABLE 20.—Pennsylvania anthracite loaded mechanically underground, 1949–50, by fields, in net tons

Field	Scraper loaders [1]		Pit-car loaders		Hand-loaded face conveyors, all types [2]		Total mechanically loaded underground	
	1949	1950	1949	1950	1949	1950	1949	1950
Northern	1,740,584	1,759,602	100,844	58,285	8,202,674	8,927,716	10,044,102	10,745,603
Eastern Middle	67,981	52,662	64,286	55,950	264,410	303,246	396,677	411,858
Western Middle	192,225	158,026	38,470	19,909	689,488	661,625	920,183	839,560
Southern	29,817	19,086	30,000	2,500	437,309	317,043	497,126	338,629
Total	2,030,607	1,989,376	233,600	136,644	9,593,881	10,209,630	11,858,088	12,335,650

[1] Includes mobile loaders.
[2] Shaker chutes, etc., including those equipped with duckbills.

TABLE 21.—Relative growth of mechanical loading, hand loading, and stripping in Pennsylvania anthracite mines, 1927–50

[Mechanical loading includes coal handled on pit-car loaders and hand-loaded face conveyors]

Year	Net tons			Index numbers: 1937=100		
	Mechanical loading underground	Stripping	Hand loading	Mechanical loading underground	Stripping	Hand loading
1927	[1] 2,223,281	2,153,156	71,434,537	20	38	224
1928	[1] 2,351,074	2,422,924	67,373,788	22	43	211
1929	3,470,158	1,911,766	66,493,690	32	34	209
1930	4,467,750	2,536,288	60,458,344	42	45	190
1931	4,384,780	3,813,237	49,074,722	41	67	154
1932	5,433,340	3,980,973	38,400,820	51	70	120
1933	6,557,267	4,932,069	34,474,844	61	87	108
1934	9,284,486	5,798,138	39,290,255	87	102	123
1935	9,279,057	5,187,072	34,503,819	87	91	108
1936	10,827,946	6,203,267	33,898,560	101	109	106
1937	10,683,837	5,696,018	31,882,514	100	100	100
1938	10,151,669	5,095,341	27,990,628	95	89	88
1939	11,773,833	5,486,479	30,797,715	110	96	97
1940	12,326,000	6,352,700	29,190,837	115	112	92
1941	13,441,987	7,316,574	30,435,277	126	128	95
1942	14,741,459	9,070,933	30,495,240	138	159	96
1943	14,745,793	8,989,387	27,990,005	138	158	88
1944	14,975,146	10,953,030	26,800,270	140	192	84
1945	13,927,955	10,056,325	20,957,744	130	177	66
1946	15,619,162	12,858,930	22,465,295	146	226	70
1947	16,054,011	12,603,545	20,909,101	150	221	66
1948	15,742,368	13,352,874	21,432,923	147	234	67
1949	11,858,088	10,376,808	15,172,562	111	182	48
1950	12,335,650	11,833,934	15,820,245	115	208	50

[1] As reported by Commonwealth of Pennsylvania, Department of Mines.

Strip-Pit Operations.—The percentage of anthracite recovered by strip-pit mining has been increasing yearly and in 1950 accounted for 30 percent of the total fresh-mined anthracite compared with 28 percent in 1949. The thick bed outcrops of coal in the Schuylkill region are more adaptable to strip mining than are the thinner beds in the Wyoming region; for this reason, 56 percent of the total strip-pit output was produced in the Schuylkill region compared with 24 and 20 percent in the Wyoming and Lehigh regions, respectively. Data on strip-pit mining are given in tables 22 and 23. Figure 2 shows graphically the production of anthracite from strip pits, by regions, 1928–50.

Cutting Machines.—Anthracite cut by machines in 1950 totaled 611,734 tons compared with 557,599 tons in 1949. Of the cutting machines used in 1950, 151 were "permissible" and 7 "all other types" compared with 141 "permissible" and 12 "all other types" in 1949.

Dredge Coal.—The tonnage of anthracite recovered from the streams draining the Pennsylvania anthracite fields declined 28 percent in 1950 from 1949. Public utilities and other industries in the general vicinity of the anthracite fields are the principal users of anthracite recovered by dredging operations. Historical data on river-coal output are shown in table 24.

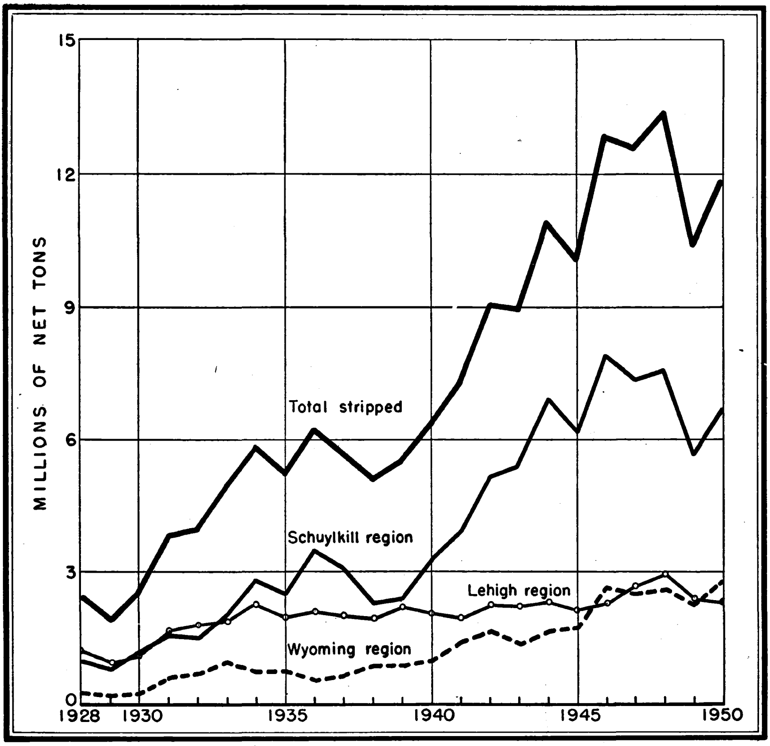

FIGURE 2.—Pennsylvania anthracite mined from strip pits, by regions, 1928–50.

TABLE 22.—Relative growth of Pennsylvania anthracite mined from strip pits, 1915, 1920, 1925, 1930, and 1945–50

	Net tons mined by stripping	Percent of fresh-mined total that was stripped	Number of men employed	Average number of days worked
1915	1,121,603	(1)	(1)	(1)
1920	2,054,441	2.5	(1)	(1)
1925	1,578,478	2.7	(1)	(1)
1930	2,536,288	3.7	(1)	(1)
1945	10,056,325	22.4	5,314	238
1946	12,858,930	25.2	6,152	252
1947	12,603,545	25.4	7,264	242
1948	13,352,874	26.5	7,005	260
1949	10,376,808	27.7	7,386	198
1950:				
Lehigh region	2,356,001	35.2	1,626	207
Schuylkill region	6,679,235	49.3	4,723	207
Wyoming region	2,798,698	14.2	1,600	231
Total [2]	11,833,934	29.6	7,949	212

[1] Data not available.
[2] No production by stripping in Sullivan County in 1950.

TABLE 23.—Power shovels and draglines used in stripping Pennsylvania anthracite, 1948–50, by type of power

Type of power	1948			1949			1950		
	Number of power shovels	Number of drag-lines	Total	Number of power shovels	Number of drag-lines	Total	Number of power shovels	Number of drag-lines	Total
Gasoline	65	8	73	66	20	86	53	11	64
Electric	54	46	100	53	45	98	48	47	95
Diesel	182	256	438	189	253	442	195	259	454
All other	3		3	1		1			
Total	304	310	614	309	318	627	296	317	613

TABLE 24.—Pennsylvania anthracite produced by dredges, 1909–50, by rivers (including tributaries)

Year	Net tons				Value	
	Lehigh River	Schuylkill River	Susque-hanna River	Total	Total	Average per ton
1909				107,788		
1910				102,853		
1911				106,005	([1])	([1])
1912				96,009		
1913				150,064		
1914				115,257		
1915	([1])	([1])	([1])	138,421	$100,744	$0.73
1916				160,507	110,831	.69
1917				170,672	206,754	1.21
1918				282,930	366,565	1.30
1919				693,093	868,746	1.25
1920				740,453	862,296	1.16
1921				623,329	650,654	1.04
1922				904,108	989,709	1.09
Total, 1909–22 [2]	([1])	([1])	([1])	4,391,489	[2] 4,156,299	1.12
1923	106,092	97,254	753,022	956,368	811,065	.85
1924	80,301	74,359	670,734	825,394	681,181	.83
1925	99,614	173,639	742,455	1,015,708	929,292	.91
1926	58,544	131,654	724,566	914,764	828,398	.91
1927	85,177	127,705	758,935	971,817	794,807	.82
1928	89,304	157,449	696,648	943,401	821,530	.87
1929	87,241	133,720	495,983	716,944	626,187	.87
1930	60,219	138,236	444,836	643,291	538,268	.84
1931	33,014	90,855	334,881	458,750	379,682	.83
1932	42,091	105,990	331,969	480,050	445,799	.93
1933	51,083	106,004	381,837	538,924	452,153	.84
1934	91,346	100,873	459,961	652,180	636,038	.98
1935	78,578	73,326	438,563	590,467	517,304	.88
1936	63,327	31,669	451,688	546,684	581,679	1.06
1937	[3] 95,065	([3])	665,409	760,474	842,052	1.11
1938	[3] 123,452	([3])	447,572	571,024	570,579	1.00
1939	62,134	67,539	574,187	703,860	746,000	1.06
1940	[3] 78,947	([3])	863,997	942,944	1,097,000	1.16
1941	47,838	396,522	1,073,203	1,517,563	1,839,784	1.21
1942	9,385	268,919	1,006,729	1,285,033	1,478,719	1.15
1943	37,452	342,815	954,470	1,334,737	1,972,777	1.48
1944	40,894	494,371	837,472	1,372,737	2,084,431	1.52
1945	41,409	366,161	797,656	1,205,226	1,924,148	1.60
1946	37,441	247,757	847,196	1,132,394	2,091,324	1.85
1947	46,478	158,102	1,015,126	1,219,706	2,480,068	2.03
1948	54,284	67,871	865,849	988,004	2,291,752	2.32
1949	22,131	52,012	790,979	865,122	2,131,096	2.46
1950	21,877	34,222	563,465	619,564	1,677,508	2.71
Total, 1923–50	1,744,718	4,039,024	18,989,388	24,773,130	32,270,621	1.30
Grand total	([1])	([1])	([1])	29,164,619	([1])	([1])

[1] Data not available.
[2] Figures for value cover 1915–22.
[3] Schuylkill included with Lehigh in 1937, 1938, and 1940.

TABLE 25.—Pennsylvania anthracite produced by dredges in 1950, by rivers (including tributaries)

River	Net tons	Value	
		Total	Average
Lehigh	21, 877	$43, 899	$2.00
Schuylkill	34, 222	114, 280	3.34
Susquehanna	563, 465	1, 519, 329	2.70
Total	619, 564	1, 677, 508	2.71

EMPLOYMENT

The number of men employed in the Pennsylvania anthracite industry in 1950 declined 4 percent from 1949. Of the total employees, 54 percent were employed in operations in the Wyoming region, 16 percent in the Lehigh, and 30 percent in the Schuylkill region; 67 percent of the total employees were men working underground, 11 percent worked in strip-pit operations, and 22 percent were in preparation plants and other surface operations.

Employment data, as shown in this study, do not include workers employed in "bootleg" coal-mining operations, conducted principally in the Schuylkill region. Although these workers are not included in the employment data, some of the coal which they produced (600,529 net tons in 1950) was purchased by the recognized industry for preparation and shipment to market, and the coal so purchased is included in the production tables of this chapter. Complete employment data on the "bootleg" holes from which this coal was produced are not available. Therefore, the purchased coal was deducted from the total tonnage reported by the operators, and the resulting net production was then used to calculate the output per man per day. Although the men employed at preparation plants of the industry proper were engaged part time in preparing this purchased coal for market, the inclusion of such time in calculating productivity will not detract materially from the validity of the figure obtained.

Detailed labor statistics are shown in tables 26 and 27.

TABLE 26.—Men employed and days worked at operations producing Pennsylvania anthracite in 1950, by region and type of plant [1]

[Includes operations of strip contractors]

Region and type of plant	Average number of men employed								Average number of days plant operated	Man-days of labor	Average tons per man per day
	Underground			Surface				Grand total			
	Miners and their laborers	Other	Total underground	In strip pits	In preparation plant	Other	Total surface				
Lehigh:											
Breaker	4,662	2,741	7,403	1,626	778	1,894	4,298	11,701	206	2,415,692	2.83
Washery [2]					18	30	48	48	180	8,631	27.08
Dredge					2	4	6	6	198	1,188	18.41
Total Lehigh	4,662	2,741	7,403	1,626	798	1,928	4,352	11,755	206	2,425,511	2.92
Schuylkill:											
Breaker	7,043	4,038	11,081	4,723	2,068	3,465	10,256	21,337	196	4,188,959	[3] 3.60
Washery [2]					61	122	183	183	137	25,085	16.01
Dredge					108	169	277	277	206	57,099	10.19
Total Schuylkill	7,043	4,038	11,081	4,723	2,237	3,756	10,716	21,797	196	4,271,143	[3] 3.76
Wyoming:											
Breaker	19,559	10,315	29,874	1,600	1,739	5,631	8,970	38,844	222	8,616,219	2.31
Washery [2]					44	84	128	128	176	22,576	15.69
Dredge					4	3	7	7	240	1,680	9.38
Total Wyoming	19,559	10,315	29,874	1,600	1,787	5,718	9,105	38,979	222	8,640,475	2.35
Total, excluding Sullivan County:											
Breaker	31,264	17,094	48,358	7,949	4,585	10,990	23,524	71,882	212	15,220,870	[3] 2.75
Washery [2]					123	236	359	359	157	56,292	17.58
Dredge					114	176	290	290	207	59,967	10.33
Total	31,264	17,094	48,358	7,949	4,822	11,402	24,173	72,531	211	15,337,129	[3] 2.83
Sullivan County	50	18	68		20	5	25	93	136	12,671	2.11
Grand total	31,314	17,112	48,426	7,949	4,842	11,407	24,198	72,624	211	15,349,800	[3] 2.83

[1] Men employed in "bootleg" operations excluded.
[2] Represents washeries for which both production and employment were separately reported.
[3] Output per man per day calculated on legitimate tonnages only; "bootleg" purchases excluded.

TABLE 27.—Men employed at operations producing Pennsylvania anthracite, 1949–50, by counties [1]

[Includes operations of strip contractors]

County	1949	1950	County	1949	1950
Carbon	5,131	3,880	Luzerne	32,528	32,361
Columbia	2,004	1,685	Northumberland	5,747	5,569
Dauphin and Susquehanna	251	92	Schuylkill	17,975	18,011
Lackawanna	11,520	10,771	Sullivan	96	93
Lancaster, Lebanon, Northampton, and Snyder [2]	125	162	Total	75,377	72,624

[1] Men employed in "bootleg" operations excluded.
[2] Counties producing dredge coal only.

CONSUMPTION

Anthracite is primarily a space-heating fuel, and the 6-percent gain in consumption in 1950 over 1949 is attributable largely to the cooler weather that prevailed. This consumption is calculated on the basis of production, imports, exports, and changes in producers' stocks; data on retail dealers' stocks are incomplete, and no attempt is made to reflect stock changes for this category. Reported consumption by electric utilities increased 8 percent over 1949; consumption by railroads increased 5 percent; anthracite mixed with bituminous coal in making coke totaled 169,275 tons compared with 172,825 tons in 1949; and anthracite used in the manufacture of fuel briquets and packaged fuel totaled 638,356 tons compared with 646,897 tons in 1949.

TABLE 28.—Apparent consumption of anthracite and selected competitive fuels in the principal anthracite markets, 1947–50

[Thousands of net tons]

Fuel	New England	New York	New Jersey	Pennsylvania	Delaware	Maryland	District of Columbia	Total	Percent of total fuels
Anthracite (all users):									
Pennsylvania: [1]									
1947	4,457	[2] 14,924	[2] 7,177	16,127	316	895	228	44,124	48.3
1948	4,600	[2] 15,004	[2] 6,806	16,116	313	709	215	43,763	45.6
1949	3,277	[2] 11,191	[2] 4,896	12,194	255	429	153	32,395	40.0
1950	3,552	[2] 11,054	[2] 5,007	12,690	266	464	179	33,212	37.4
Imported: [3]									
1947		7						7	(4)
1948						1		1	(4)
1949									
1950	18							18	(4)
Briquets (for domestic use): [5]									
Domestic origin:									
1947	49	49	32	126	1	29	2	288	.3
1948	59	44	26	88	1	24	3	245	.3
1949	25	21	21	39	(6)	15	1	122	.2
1950	36	23	13	39	(6)	22	3	136	.2
Imported: [3]									
1947								(6)	(4)
1948									
1949								(6)	(4)
1950									(4)
Coke (for domestic use):									
Domestic origin: [5]									
1947	834	693	407	220	(6)	1		2,155	2.4
1948	778	689	386	242	1	(6)		2,096	2.2
1949	592	510	281	168	(6)	1		1,552	1.9
1950	617	545	348	186	(6)	1		1,697	1.9
Imported: [3]									
1947	1							1	(4)
1948	1	38						39	(4)
1949	1	83						84	.1
1950	56	30						86	.1
Oil: Heating and range: [7]									
1947	16,855	12,940	7,153	4,880	257	1,929	793	44,807	49.0
1948	18,652	14,390	8,224	5,207	278	2,256	776	49,783	51.9
1949	17,353	14,086	7,735	4,418	433	2,048	713	46,786	57.8
1950	19,807	15,877	8,558	5,686	476	2,454	783	53,641	60.4
Total:									
1947	22,196	28,613	14,769	21,353	574	2,854	1,023	91,382	100.0
1948	24,090	30,165	15,442	21,653	593	2,990	994	95,927	100.0
1949	21,248	25,891	12,933	16,819	688	2,493	867	80,939	100.0
1950	24,086	27,529	13,926	18,601	742	2,941	965	88,790	100.0

[1] Shipments to these markets as reported by Pennsylvania Department of Mines; illicit coal not included.
[2] An important but undetermined part of anthracite shown as shipped to New Jersey is reshipped to New York City.
[3] U. S. Department of Commerce.
[4] Less than 0.05 percent.
[5] Shipments to the States indicated.
[6] Less than 500 tons.
[7] Converted to coal equivalent upon basis of 4 barrels of fuel oil equaling 1 ton of coal.

The New England and Middle Atlantic States, Maryland, Delaware, and the District of Columbia received 96 percent of the total shipments of anthracite to points in the United States in 1950. Data on the consumption of all fuels in this area are not available; however, the apparent consumption of anthracite, domestic coke, briquets, and heating and range oils, in terms of anthracite, are given in table 28.

Mechanical Stokers.—Data of the Bureau of the Census, United States Department of Commerce, show that factory sales of class 1 mechanical stokers for burning anthracite (capacity under 61 pounds of coal per hour) decreased from 4,616 units (revised figure) in 1949 to 4,191 units in 1950; sales of class 2 stokers (capacity 61 to 100 pounds of coal per hour) decreased from 489 units (revised figure) in 1949 to 487 units in 1950.

DISTRIBUTION

Data in table 30 cover the distribution of Pennsylvania anthracite for the coal year April 1, 1949, to March 31, 1950; they are not comparable with the statistics elsewhere in this chapter on production, consumption, exports, etc., inasmuch as the latter are compiled on a calendar year basis. The distribution data were voluntarily submitted to the Bureau by producers, American and Canadian wholesalers, and dock operators, and represent the eighth in a series of mineral market surveys on the subject.

Shipments (including local sales) reported for the 1949–50 coal year declined 14 percent compared with shipments for the 1948–49 coal year. The decline may be attributed to a combination of several factors, the most important of which was the generally mild weather in the primary anthracite market areas during the winter of 1949–50, the competition of natural gas and oil, marked improvement in the output of the major European coal-producing countries, and loss of a small part of the Canadian market to Welsh anthracite. Shipments to destinations in the United States declined 13 percent from the 1948–49 coal year, Canada showed a decrease of 17 percent, and exports to countries other than Canada declined 40 percent.

Data compiled from records of Pennsylvania State Department of Mines indicate that anthracite shipments from the mines to destinations in the United States increased 3 percent in 1950 compared with 1949. In 1950, 80 percent of the shipments destined to points in this country moved from the mines by rail and 20 percent by truck, as compared to 82 and 18 percent, respectively, in 1949. Pennsylvania received 86 percent of the truck shipments in 1950, New Jersey 6 percent, and New York 7 percent. Anthracite rail shipments by States of destination for 1947–50 are shown in table 29, and the movement of anthracite by truck in 1950, by months and States of destination, in table 31.

According to data compiled from records of the Massachusetts Division on the Necessaries of Life and the Association of American Railroads, rail receipts of Pennsylvania anthracite in New England increased 8 percent over 1949 while tidewater receipts decreased 43 percent. Details on anthracite movement to New England

TABLE 30.—Distribution of Pennsylvania anthracite April 1, 1949, to March 31, 1950, by States, Canadian Provinces, and other countries of destination, in net tons

Destinations	Domestic sizes						Steam sizes						Total all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Buckwheat No. 2 (Rice)	Buckwheat No. 3 (Barley)	Buckwheat No. 4	All other sizes	Total steam		
United States:														
New England States:														
Connecticut	180	17, 161	303, 065	333, 046	31, 842	685, 294	51, 563	35, 744	21, 145		266	108, 718	794, 012	1. 91
Maine		23, 559	96, 854	85, 622	4, 445	210, 480	16, 864	11, 000			1, 587	29, 451	239, 931	. 58
Massachusetts	1, 215	184, 414	918, 359	513, 582	39, 649	1, 657, 219	126, 436	74, 958	54, 633	2, 455	2, 184	260, 666	1, 917, 885	4. 62
New Hampshire		16, 452	77, 188	58, 708	4, 474	156, 822	20, 807	48, 970	47, 018		762	117, 557	274, 379	. 66
Rhode Island		15, 372	114, 599	81, 378	5, 700	217, 049	13, 410	11, 448			149	25, 007	242, 056	. 58
Vermont	189	12, 060	75, 362	58, 943	8, 205	154, 759	36, 438	20, 165	26, 185			82, 788	237, 547	. 57
Total	1, 584	269. 018	1, 585, 427	1, 131, 279	94, 315	3, 081, 623	265, 518	202, 285	148, 981	2, 455	4, 948	624, 187	3, 705, 810	8. 92
Middle Atlantic States:														
New Jersey	7, 601	58, 543	739, 782	1, 594, 476	432, 342	2, 832, 744	670, 036	522, 494	887, 233	327, 278	57, 863	2, 464, 904	5, 297, 648	12. 75
New York	14, 344	514, 894	2, 938, 465	2, 648, 026	896, 256	7, 011, 985	3, 030, 460	989, 695	893, 524	419, 435	250, 314	5, 583, 428	12, 595, 413	30. 31
Pennsylvania [1]	63, 859	155, 346	977, 940	2, 518, 176	1, 960, 387	5, 675, 708	1, 233, 407	1, 159, 271	2, 004, 598	1, 633, 664	842, 742	6, 873, 682	12, 549, 390	30. 20
Total	85, 804	728, 783	4, 656, 187	6, 760, 678	3, 288, 985	15, 520, 437	4, 933, 903	2, 671, 460	3, 785, 355	2, 380, 377	1, 150, 919	14, 922, 014	30, 442, 451	73. 26
South Atlantic States: [2]														
Delaware		10, 903	51, 927	133, 380	15, 688	211, 898	6, 608	5, 783	12, 914	16, 761	10, 046	52, 112	264, 010	. 63
District of Columbia		10, 788	60, 657	72, 008	17, 874	161, 327	19, 137	2, 405	2, 209			23, 751	185, 078	. 45
Maryland	1, 105	31, 393	179, 543	192, 816	28, 633	433, 490	67, 695	7, 843	25, 736	7, 016	355	108, 645	542, 135	1. 30
Virginia		7, 453	27, 515	38, 783	7, 223	80, 974	27, 865	310	1, 849	103	230	30, 357	111, 331	. 27
Total	1, 105	60. 537	319, 642	436, 987	69, 418	887, 689	121, 305	16, 341	42, 708	23, 880	10, 631	214, 865	1, 102, 554	2. 65
Lake States: [3]														
Illinois	753	6, 292	39, 225	83, 253	1, 677	131, 200	5, 331	14, 377	9, 266	10, 413	29, 266	68, 653	199, 853	. 48
Michigan	81	44, 152	124, 064	92, 240	8, 822	269, 359	4, 796	25, 303		3, 127	80, 733	113, 959	383, 318	. 92
Minnesota		397	13, 995	19, 410	1, 691	35, 493	2, 503	305		8, 422	99	11, 329	46, 822	. 11
Ohio	59	12, 368	6, 230	41, 737	2, 202	62, 596	3, 763	4, 406	1, 125	916	317	10, 527	73, 123	. 18
Wisconsin		287	166, 534	236, 346	28, 201	431, 368	12, 836	3, 927		122, 644	194, 801	334, 208	765. 576	1. 84
Total	893	63, 496	350, 048	472. 986	42, 593	930, 016	29, 229	48, 318	10, 391	145, 522	305, 216	538, 676	1, 468, 692	3. 53
All other States	52	10. 420	10, 259	90, 104	3, 501	114, 336	16, 837	4, 710	346	11, 870	22. 721	56, 484	170, 820	. 41
Total United States	89, 438	1, 132, 254	6. 921, 563	8, 892, 034	3, 498, 812	20, 534, 101	5, 366. 792	2, 943, 114	3, 987, 781	2, 564, 104	1, 494, 435	16, 356, 226	36, 890, 327	88. 77

TABLE 30.—Distribution of Pennsylvania anthracite April 1, 1949, to March 31, 1950, by States, Canadian Provinces, and other countries of destnation, in net tons—Continued

Destinations	Domestic sizes						Steam sizes						Total all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total domestic	Buckwheat No. 1	Buckwheat No. 2 (Rice)	Buckwheat No. 3 (Barley)	Buckwheat No. 4	All other sizes	Total steam		
Canada:														
Ontario	182	185,063	1,214,092	1,017,912	59,949	2,477,198	110,999	62,650	1,749	49	3,063	178,510	2,655,708	6.39
Quebec	95	35,366	291,826	171,356	12,289	510,932	221,142	126,733	30,436	1,493	14,048	393,852	904,784	2.18
Other provinces	385	4,799	19,685	22,703	386	47,958	10,508	6,132			283	16,923	64,881	.16
Total Canada	662	225,228	1,525,603	1,211,971	72,624	3,036,088	342,649	195,515	32,185	1,542	17,394	589,285	3,625,373	8.73
Other countries [4]				34	76,331	76,365	23,543	111,341	14,865	253,987	560,214	963,950	1,040,315	2.50
Grand total	90,100	1,357,482	8,447,166	10,104,039	3,647,767	23,646,554	5,732,984	3,249,970	4,034,831	2,819,633	2,072,043	17,909,461	41,556,015	100.00

[1] Includes "local sales."
[2] Shipments to other States generally referred to as being in the South Atlantic area are included in "All other States."
[3] Shipments to Indiana are included in "All other States."
[4] Japan received all of the Pea coal indicated and Italy all of the Buckwheat No. 1. The Netherlands imported about 95 percent of the Rice and Barley, and France received more than 98 percent of the Buckwheat No. 4 and smaller.

are given in table 32. Loadings at Lake Erie ports remained virtually the same, and receipts at upper Lake docks increased 14 percent over 1949.

Shipments of anthracite from the Lehigh, Schuylkill, and Wyoming regions, 1890–1950, inclusive, are shown graphically in figure 3.

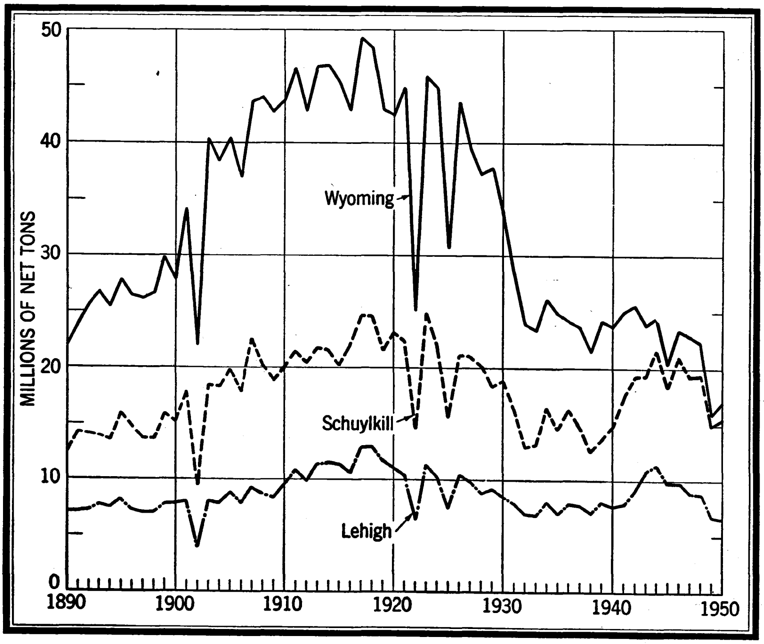

FIGURE 3.—Anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1890–1950.

TABLE 29.—Rail shipments of Pennsylvania anthracite, 1947–50, by destinations, in net tons [1]

[Pennsylvania Department of Mines]

Destination	1947	1948	1949	1950
New England States	4,456,476	4,600,429	3,277,034	3,551,489
New York	14,530,238	14,526,250	10,804,020	10,589,197
New Jersey	6,697,055	6,213,667	4,522,749	4 613,659
Pennsylvania	10,138,523	9,706,429	6,935,710	6,740,610
Delaware	295,288	283,106	237,479	245,097
Maryland	830,546	626,948	396,561	431,546
District of Columbia	228,383	214,291	152,940	177,754
Virginia	116,650	118,611	84,275	73,809
Ohio	98,729	118,735	50,673	94,022
Indiana	78,303	94,492	66,773	80,209
Illinois	285,648	286,888	152,791	211,366
Wisconsin	486,975	627,366	463,625	489,784
Minnesota	19,749	48,683	47,944	61,353
Michigan	354,643	351,304	235,703	249,088
Other States	62,575	57,070	57,148	86,213
Total United States	38,679,781	37,874,269	27,485,425	27,695,196
Canada	3,828,980	3,977,698	3,154,387	3,620,573
Other foreign countries	1,854,042	913,920	671,350	35,139
Grand total	44,362,803	42,765,887	31,311,162	31,350,908

[1] Does not include dredge coal.

TABLE 31.—Truck shipments of Pennsylvania anthracite in 1950, by months and by States of destination, in net tons [1]

Destination	January	February	March	April	May	June	July
Pennsylvania:							
Within region	353,387	340,281	453,224	266,203	253,975	212,095	171,810
Outside region	176,847	214,582	325,765	159,473	139,348	150,414	110,925
New York	37,020	35,004	61,748	35,186	35,630	39,274	30,822
New Jersey	32,452	27,151	49,247	27,517	29,794	34,114	24,817
Delaware	1,544	1,934	4,623	2,037	1,127	329	619
Maryland	4,179	3,738	3,652	2,687	839	926	1,348
District of Columbia	68	----------	330	----------	----------	----------	228
Other States	1,768	1,541	2,294	1,732	1,106	668	705
Total: 1950	607,265	624,231	900,883	494,835	461,819	437,820	341,274
1949	679,061	553,579	466,330	479,955	555,043	437,161	292,331

Destination	August	September	October	November	December	Total	Percent of total trucked
Pennsylvania:							
Within region	247,090	283,348	297,232	335,055	478,164	3,691,864	53.7
Outside region	280,978	164,800	189,135	162,096	183,190	2,257,553	32.8
New York	40,785	37,161	42,115	34,279	35,533	464,557	6.7
New Jersey	35,001	34,781	39,082	27,365	32,238	393,559	5.7
Delaware	609	821	2,164	2,192	3,042	21,041	.3
Maryland	2,232	3,393	3,335	3,150	3,431	32,910	.5
District of Columbia	468	136	96	----------	282	1,608	(2)
Other States	810	1,313	2,002	1,854	1,800	17,593	.3
Total: 1950	607,973	525,753	575,161	565,991	737,680	6,880,685	100.0
1949	374,380	358,731	605,332	632,146	654,075	6,088,124	100.0

[1] Compiled from reports of Pennsylvania Department of Mines. Does not include dredge coal.
[2] Less than 0.05 percent.

TABLE 32.—Receipts of anthracite in New England, 1917, 1920, 1923, 1927, and 1940–50, in thousands of net tons

Year	Receipts by tidewater: Maine	New Hampshire	Massachusetts	Rhode Island	Connecticut	Total	Receipts by rail [1]	Imports [2]	Total receipts of Pennsylvania anthracite [3]
1917	[1] 432	[1] 47	[1] 2,222	[1] 555	[1] 1,165	[1] 4,421	7,259	1	11,679
1920	[1] 307	[1] 6	[1] 2,015	[1] 450	[1] 743	[1] 3,521	7,804	1	11,324
1923	[1] 437	[1] 27	[1] 2,216	[1] 511	[1] 891	[1] 4,082	8,102	145	12,039
1927	[1] 242	[1] 33	[1] 1,220	[1] 311	[1] 615	[1] 2,421	6,725	106	9,040
1940	[1] 48	[1] 4	[1] 350	[1] 74	[1] 172	[1] 648	4,174	135	4,687
1941	[1] 57	[1] 9	[1] 348	[1] 58	[1] 210	[1] 682	4,870	75	5,477
1942	(4)	(4)	(4)	(4)	(4)	581	5,393	139	5,835
1943	(4)	(4)	(4)	(4)	(4)	575	5,310	164	5,721
1944	(4)	(4)	(4)	(4)	(4)	398	5,836	12	6,222
1945	(4)	(4)	(4)	(4)	(4)	331	4,750	(5)	5,081
1946	(4)	(4)	(4)	(4)	(4)	399	5,244	----------	5,643
1947	(4)	(4)	(4)	(4)	(4)	240	4,498	----------	4,738
1948	(4)	(4)	(4)	(4)	(4)	217	4,646	----------	4,863
1949	(4)	(4)	(4)	(4)	(4)	110	3,336	----------	3,446
1950	(4)	(4)	(4)	(4)	(4)	63	3,615	----------	3,678

[1] Commonwealth of Massachusetts, Division on the Necessaries of Life.
[2] U. S. Department of Commerce.
[3] Total receipts by rail and by tidewater less imports.
[4] Data for individual States not available. Total tidewater as reported by Association of American Railroads.
[5] Less than 500 tons.

STOCKS

Stocks of Pennsylvania anthracite held by producing companies at the end of January 1950 totaled 657,710 net tons. A low point of 183,169 tons was reached in March, but stocks increased rapidly thereafter to a peak of 1,415,956 tons in November. They fell again to 1,268,300 tons at the end of December, but this represented a 30-percent increase over stocks held by producers in December 1949. Stocks on the upper Lake docks in December 1950 virtually equaled those in the same month of 1949—242,237 tons as compared to 246,825 tons. Stocks held by public utility plants remained at a level exceeding 4,000,000 tons throughout the year—totaling 4,720,147 tons in December. Stocks held by class I railroads in December 1950 were 61,081 tons compared to 66,388 tons in December 1949.

Early in 1950, for the first time in many years, the Bureau began to collect and publish monthly data on stocks of Pennsylvania anthracite held in retail dealer yards. The first canvass of a selected list of representative dealers indicated that stocks of space-heating sizes held in all retail yards handling anthracite on March 31, 1950, totaled 1,760,000 net tons, broken down as follows: Egg, Stove, and Chestnut sizes combined, 979,000 tons; Pea, 256,000 tons; and Buckwheat No. 1 and Rice, 525,000 tons. Stocks increased thereafter to a peak of 3,813,000 tons on October 31 but declined to 3,452,000 tons by December 31. Stocks at the close of the year comprised an estimated 2,041,000 tons of Egg, Stove, and Chestnut sizes, 342,000 tons of Pea, and 1,069,000 tons of Buckwheat No. 1 and Rice.

PRICES

According to Saward's Journal, f. o. b. mine prices for anthracite at the end of 1950 varied from $12.80 to $13.55 per net ton on Broken and Egg sizes; $12.75 to $13.80 on Stove; $12.60 to $13.80 on Chestnut; $10.50 to $11.20 on Pea; $7.40 to $8.00 on Buckwheat No. 1; $6.00 to $6.60 on Rice; and $4.75 to $5.05 on Barley. A number of companies normally sell coal of a certain grade from some mines at a small premium over the quoted circular prices. It is to be noted that the prices are f. o. b. mine quotations and differ from retail prices, which include transportation and dealer costs. Data compiled from reports of the Bureau of Labor Statistics, United States Department of Labor, giving retail prices for certain fuels in selected cities by months for 1950, are shown in table 33.

TABLE 33.—Retail prices of selected fuels in 1950, by months, for various cities

[Coal and coke, per net ton; heating oil, per 100 gallons]

City and fuel	January	February	March	April	May	June	July	August	September	October	November	December
Baltimore, Md.:[2]												
Anthracite:												
Stove	$20.28	$20.28	$20.28	$21.01	$19.91	$19.91	$20.30	$20.39	$20.71	$20.79	$21.21	$21.21
Buckwheat No. 1	14.92	14.92	14.92	15.04	14.28	14.28	14.79	14.79	14.85	14.92	15.04	15.04
Heating oil: Fuel oil No. 2	11.63	11.45	11.42	11.02	11.02	11.42	11.42	11.42	11.93	12.15	12.44	12.44
Boston, Mass.:												
Anthracite:												
Stove	22.50	22.50	22.50	23.50	22.00	22.00	22.75	23.56	23.56	24.01	24.08	24.20
Buckwheat No. 1	16.45	16.45	16.45	16.80	15.80	15.80	16.30	16.86	16.86	17.16	17.22	17.35
Coke: Egg	21.75	21.75	21.75	22.75	20.95	20.95	21.75	22.75	22.75	23.20	23.20	23.20
Heating oil: Fuel oil No. 2	11.90	11.50	11.50	11.00	11.00	11.40	11.40	11.40	12.00	12.30	12.50	12.50
Buffalo, N. Y.:[3]												
Anthracite: Stove	21.12	21.12	21.37	21.56	20.94	21.17	21.40	21.68	21.90	22.13	22.38	22.57
Coke: Nut	18.94	18.94	19.44	19.95	19.95	19.95	19.95	19.95	20.62	20.62	20.79	20.96
Heating oil:												
Fuel oil No. 2	12.93	12.93	12.93	12.22	12.22	12.93	12.93	13.03	13.23	13.57	13.74	13.74
Fuel oil No. 3	12.93	12.93	12.93	12.22	12.22	12.93	12.93	12.93	13.23	13.48	13.74	13.74
Milwaukee, Wis.:												
Anthracite: Stove	22.60	22.60	22.72	23.35	22.10	22.10	22.60	22.85	23.10	23.35	23.35	24.22
Bituminous coal: Low-volatile Stove	19.70	19.70	19.70	20.08	18.95	18.95	18.95	19.20	19.39	19.82	19.95	20.32
Coke: Nut	20.51	20.51	20.51	20.51	20.51	20.50	20.50	21.00	21.00	21.50	21.66	22.16
Heating oil:												
Fuel oil No. 2	12.70	13.10	13.10	13.10	13.10	13.10	13.10	13.10	13.10	13.60	13.60	13.72
Fuel oil No. 3	12.60	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.50	13.50	13.58
New York, N. Y.:[2]												
Anthracite:												
Stove	21.26	21.26	21.43	22.07	21.42	21.42	21.93	22.44	22.89	23.14	23.39	23.40
Buckwheat No. 1[4]	14.05	14.05	14.12	14.15	13.75	13.70	13.96	14.21	14.47	14.72	14.88	14.88
Coke: Nut	22.06	22.06	22.06	22.06	21.00	20.69	21.55	22.01	22.50	22.81	23.07	23.05
Heating oil: Fuel oil No. 2	12.02	11.63	11.15	11.00	11.00	11.33	11.33	11.51	12.08	12.38	12.61	12.63
Philadelphia, Pa.:												
Anthracite:												
Stove	19.84	19.84	19.84	20.71	19.28	19.28	19.54	20.16	20.49	20.64	20.71	20.99
Buckwheat No. 1	13.83	13.83	13.83	14.05	13.72	13.72	13.72	13.87	14.08	14.22	14.22	14.43
Coke: Nut	19.82	20.08	20.08	19.58	18.95	18.95	19.32	19.95	20.12	20.54	20.65	20.95
Heating oil: Fuel oil No. 2	11.58	11.28	10.88	10.88	10.88	11.28	11.28	11.50	11.70	11.80	12.20	12.20

Portland, Maine:												
Anthracite:												
Stove	21.50	21.50	21.50	22.25	20.70	21.17	21.44	21.71	21.97	22.25	22.25	22.25
Buckwheat No. 1	16.25	16.25	16.25	16.41	14.95	15.32	15.66	15.92	16.19	16.45	16.45	16.45
Coke: Egg	21.00	21.00	21.00	21.75	20.20	20.20	20.48	21.37	21.49	21.75	21.75	21.75
Heating oil: Fuel oil No. 2	11.90	11.50	11.50	10.90	10.90	11.30	11.30	11.40	11.90	12.10	12.40	12.40
Washington, D. C.:[3]												
Anthracite:												
Stove	20.30	20.30	20.30	21.09	20.04	20.30	20.60	21.10	21.36	21.54	21.60	21.85
Buckwheat No. 1	14.69	14.69	14.69	14.96	14.43	14.59	14.74	15.04	15.20	15.27	15.30	15.45
Bituminous coal: Low-volatile Stove	17.48	17.48	17.75	17.85	17.34	17.34	17.34	17.85	17.85	18.04	18.10	18.10
Heating oil: Fuel oil No. 2	12.04	11.83	11.83	11.42	11.42	11.83	11.83	11.83	12.34	12.47	12.85	12.85

[1] Compiled from reports of Bureau of Labor Statistics. Prices are as of the 15th of each month. Data are preliminary.

[2] Includes 2-percent sales tax.

[3] Includes 1-percent sales tax.

[4] Commercial.

VALUE OF SALES

Increased labor and material expenses resulted in higher total mine costs per ton of anthracite in 1950 than in 1949. Average sales realization per net ton on breaker shipments to points outside the local sales area increased 5 percent over 1949; when colliery fuel, local sales, river coal, and washery coal are included, the average per-ton value of the 1950 production increased 6 percent over 1949. The average sales-realization figures in this study represent value at the breaker, washery, or dredge, and the reporting company is asked to "exclude selling expenses"; therefore, when a producing company sells its output to separately organized sales company, the value reported will exclude the margin of the sales company and may, therefore, be somewhat less than the circular price at which the coal is placed on the open market. See tables 34 to 36 for detailed sales-realization data.

TABLE 34.—Average sales realization per net ton of Pennsylvania anthracite shipped from breakers to points outside and inside producing region in 1950, by regions and sizes

[Value does not include margins of separately incorporated sales companies]

Size	Lehigh region			Schuylkill region			Wyoming region		
	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total	Shipped outside region	Local sales	Total
Lump [1] and Broken	$12.27	$11.91	$12.27	$12.14	$12.36	$12.16	$12.10	$11.48	$11.90
Egg	12.20	13.10	12.21	12.06	12.45	12.06	12.03	12.49	12.03
Stove	12.46	12.85	12.47	12.20	12.34	12.20	12.21	12.81	12.22
Chestnut	12.44	13.05	12.48	12.14	12.41	12.15	12.20	12.82	12.25
Pea	10.24	10.79	10.35	9.77	9.87	9.78	9.98	10.59	10.23
Total domestic	12.12	11.82	12.11	11.79	11.28	11.77	11.99	11.53	11.94
Buckwheat No. 1	6.90	7.47	6.94	6.64	6.74	6.64	6.83	7.29	6.90
Buckwheat No. 2 (Rice)	5.70	6.44	5.77	5.53	5.65	5.53	5.76	6.11	5.82
Buckwheat No. 3 (Barley)	4.50	5.13	4.51	4.37	4.86	4.39	4.58	4.80	4.64
Buckwheat No. 4	3.43	4.31	3.43	3.24	3.08	3.20	3.54	3.08	3.45
Other (including silt)	2.83	--------	2.83	3.06	2.81	3.06	2.72	2.00	2.58
Total steam	5.08	6.77	5.16	4.94	4.16	4.89	5.77	5.79	5.78
Total all sizes	9.07	9.98	9.12	8.51	7.32	8.45	10.17	8.93	10.01

Size	Sullivan County			Total					
				Excluding Sullivan County			Including Sullivan County		
Lump [1] and Broken	--------	--------	--------	$12.15	$11.55	$12.04	$12.15	$11.55	$12.04
Egg	--------	--------	--------	12.07	12.50	12.07	12.07	12.50	12.07
Stove	$11.74	$11.74	$11.74	12.25	12.66	12.25	12.25	12.65	12.25
Chestnut	11.50	11.50	11.50	12.21	12.76	12.25	12.21	12.75	12.25
Pea	9.50	9.50	9.50	9.94	10.50	10.09	9.94	10.50	10.09
Total domestic	10.89	10.92	10.90	11.94	11.51	11.91	11.94	11.51	11.91
Buckwheat No. 1	6.25	6.25	6.25	6.76	7.22	6.81	6.76	7.22	6.81
Buckwheat No. 2 (Rice)	--------	--------	--------	5.65	6.12	5.70	5.65	6.12	5.70
Buckwheat No. 3 (Barley)	--------	--------	--------	4.46	4.82	4.50	4.46	4.82	4.50
Buckwheat No. 4	--------	--------	--------	3.33	3.08	3.28	3.33	3.08	3.28
Other (including silt)	4.00	3.98	3.99	2.96	2.01	2.94	2.97	2.10	2.94
Total steam	4.95	4.94	4.94	5.25	5.40	5.26	5.25	5.40	5.26
Total all sizes	8.58	8.65	8.60	9.34	8.65	9.28	9.34	8.65	9.28

[1] Quantity of Lump included is insignificant.

TABLE 35.—Average sales realization per net ton of Pennsylvania anthracite shipped from breakers to points outside producing region, 1946–50, by regions and sizes

[Value does not include margins of separately incorporated sales companies]

Size	Lehigh region					Schuylkill region				
	1946	1947	1948	1949	1950	1946	1947	1948	1949	1950
Lump[1] and Broken	$9.14	$10.21	$11.47	$11.98	$12.27	$9.43	$10.10	$11.09	$11.56	$12.14
Egg	9.32	10.23	11.42	11.81	12.20	9.48	10.11	11.22	11.57	12.06
Stove	9.42	10.23	11.44	11.80	12.46	9.52	10.02	11.34	11.56	12.20
Chestnut	9.40	10.24	11.45	11.81	12.44	9.54	10.07	11.38	11.62	12.14
Pea	7.72	8.44	9.50	9.86	10.24	7.89	8.17	9.33	9.56	9.77
Total domestic	9.15	9.97	11.16	11.53	12.12	9.27	9.77	11.03	11.27	11.79
Buckwheat No. 1	5.51	5.97	6.52	6.64	6.90	5.55	5.76	6.39	6.43	6.64
Buckwheat No. 2 (Rice)	4.50	4.93	5.53	5.56	5.70	4.54	4.78	5.37	5.46	5.53
Buckwheat No. 3 (Barley)	3.09	3.57	4.14	4.36	4.50	3.09	3.52	4.03	4.26	4.37
Buckwheat No. 4	2.26	2.65	2.96	3.23	3.43	2.14	2.39	2.84	3.11	3.24
Other (including silt)	1.95	2.21	2.50	2.79	2.83	1.83	2.16	2.68	2.91	3.06
Total steam	3.88	4.25	4.73	4.80	5.08	3.94	4.09	4.68	4.79	4.94
Total all sizes	6.83	7.43	8.38	8.47	9.07	6.78	6.97	7.98	8.12	8.51

Size	Wyoming region					Sullivan County				
Lump[1] and Broken	$9.26	$9.87	$11.06	$11.66	$12.10					
Egg	9.33	10.01	11.15	11.54	12.03					
Stove	9.33	9.98	11.24	11.61	12.21	$9.19	$11.36	$9.67	$10.96	$11.74
Chestnut	9.34	9.98	11.20	11.60	12.20	9.13	10.20	9.59	10.98	11.50
Pea	7.74	8.19	9.31	9.70	9.98	7.95	9.28	7.86	8.88	9.50
Total domestic	9.19	9.81	11.04	11.42	11.99	8.87	10.12	9.31	10.71	10.89
Buckwheat No. 1	5.51	5.81	6.50	6.63	6.83	4.70	3.98	5.99	5.00	6.25
Buckwheat No. 2 (Rice)	4.52	4.84	5.48	5.63	5.76	2.62	3.14			
Buckwheat No. 3 (Barley)	3.16	3.63	4.15	4.37	4.58					
Buckwheat No. 4	1.85	2.49	3.01	3.32	3.54					
Other (including silt)	1.86	1.74	2.13	2.81	2.72	1.75	1.93	4.10	3.26	4.00
Total steam	4.38	4.67	5.30	5.63	5.77	3.31	2.39	4.50	3.44	4.95
Total all sizes	7.81	8.27	9.35	9.77	10.17	6.20	6.54	7.50	9.26	8.58

Size	Total									
	Excluding Sullivan County					Including Sullivan County				
Lump[1] and Broken	$9.23	$10.07	$11.19	$11.71	$12.15	$9.23	$10.07	$11.19	$11.71	$12.15
Egg	9.38	10.08	11.22	11.60	12.07	9.38	10.08	11.22	11.60	12.07
Stove	9.40	10.03	11.30	11.63	12.25	9.40	10.03	11.29	11.63	12.25
Chestnut	9.42	10.05	11.30	11.64	12.21	9.42	10.05	11.29	11.64	12.21
Pea	7.79	8.23	9.36	9.67	9.94	7.79	8.23	9.35	9.67	9.94
Total domestic	9.21	9.82	11.05	11.39	11.94	9.21	9.82	11.05	11.39	11.94
Buckwheat No. 1	5.53	5.82	6.46	6.55	6.76	5.53	5.82	6.46	6.55	6.76
Buckwheat No. 2 (Rice)	4.52	4.83	5.45	5.54	5.65	4.52	4.83	5.45	5.54	5.65
Buckwheat No. 3 (Barley)	3.11	3.56	4.09	4.31	4.46	3.11	3.56	4.09	4.31	4.46
Buckwheat No. 4	2.09	2.46	2.89	3.18	3.33	2.09	2.46	2.89	3.18	3.33
Other (including silt)	1.90	2.06	2.49	2.87	2.96	1.90	2.06	2.50	2.87	2.97
Total steam	4.08	4.32	4.90	5.05	5.25	4.08	4.32	4.90	5.05	5.25
Total all sizes	7.25	7.65	8.67	8.90	9.34	7.25	7.65	8.67	8.90	9.34

[1] Quantity of Lump included is insignificant.

TABLE 36.—Average sales realization per net ton of Pennsylvania anthracite from all sources, 1949–50, by regions [1]

[Data include washery and dredge coal]

Region	1949				1950			
	Shipped outside region	Local sales	Colliery fuel	Total production	Shipped outside region	Local sales	Colliery fuel	Total production
Lehigh	$8.23	$9.83	$6.31	$8.26	$8.82	$9.98	$6.52	$8.83
Schuylkill	7.73	6.10	2.40	7.56	8.20	6.77	2.47	8.05
Wyoming	9.55	8.36	2.95	9.13	10.06	8.63	3.38	9.63
Total, excluding Sullivan County	8.59	7.86	3.33	8.38	9.12	8.28	3.66	8.90
Sullivan County	9.26	9.67		9.42	8.58	8.65		8.60
Grand total	8.59	7.87	3.33	8.38	9.12	8.28	3.66	8.90

[1] Value given for shipments is value at which coal left possession of producing company and does not include margins of separately incorporated sales companies. Imputed value of colliery fuel, as reported by producers, based on market price.

FOREIGN TRADE [2]

Exports of Pennsylvania anthracite in 1950 decreased 21 percent from 1949. The decline may be attributed entirely to the sharp reduction in shipments to European destinations, inasmuch as exports to Canada increased slightly over 1949. Anthracite exports to Europe had reached a peak of 3,918,463 net tons in 1947 but declined steadily throughout the period 1948–50.

In addition to the anthracite exported from the United States to Canada in 1950, that country also received 395,867 tons from Great Britain and 262 tons from the Union of South Africa. Since in the Province of Ontario the British product is generally unable to compete in price with Pennsylvania anthracite, the effect of Welsh anthracite competition is felt chiefly in the Province of Quebec and the Maritime Provinces. In the years before World War II, Great Britain annually exported an average of 1,200,000 tons of anthracite to Canada. However, increased industrial activity in Great Britain and an accompanying rise in coal consumption forced drastic curtailment in British coal exports to all countries, beginning in the late months of 1950.

Imports of anthracite into the United States totaled 18,289 net tons in 1950, of which 18,176 tons came from Great Britain. Details on imports of anthracite for the period 1948–50 are presented in table 38.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 37.—Anthracite exported from the United States, 1949–50, by countries and customs districts, in net tons

[U. S. Department of Commerce]

Country	1949	1950
North America:		
Bermuda	958	442
British West Indies	72	203
Canada	3,580,568	3,798,285
Newfoundland-Labrador	2,729	
Mexico	11,852	9,553
South America:		
Chile	70	
Colombia	20	10
Venezuela	235	5
Europe:		
Belgium-Luxembourg		20,744
France	1,051,313	50,614
Italy	29,772	
Netherlands	155,458	
Norway	123	
Yugoslavia	6,548	10,572
Asia:		
Israel-Palestine	14,720	
Japan	88,227	
Other Asia	5	23
Africa:		
Belgian Congo		1,113
Other Africa		5
Total	4,942,670	3,891,569

Customs district	1949	1950
North Atlantic:		
Maine and New Hampshire	16,943	12,620
New York	3,509	1,939
Philadelphia	1,289,208	108,602
South Atlantic:		
Maryland	164	
Virginia	62	203
Gulf Coast:		
Florida	10	
New Orleans	12	10
Mexican border:		
Arizona	51	
El Paso	17	
Laredo	24	119
Pacific Coast: Washington	9	
Northern border:		
Buffalo	2,257,022	2,507,193
Dakota	2,945	2,665
Duluth and Superior	11,644	6,827
Michigan	3,724	121
Ohio	14,365	20,237
Rochester	90,901	89,962
St. Lawrence	1,161,805	1,138,685
Vermont	2,028	2,386
Total	[1] 4,942,670	3,891,569

[1] Includes 88,227 tons shipped on vessels operated by the U. S. Army or Navy which was not shown separately by customs district.

TABLE 38.—Anthracite imported for consumption in the United States, 1948–50,[1] by countries and customs districts, in net tons

[U. S. Department of Commerce]

Country	1948	1950
Argentina	1	
Canada	144	113
United Kingdom	800	18,176
	945	18,289

Customs district	1948	1950
Maryland	800	
Massachusetts		17,970
Michigan		113
New Orleans		206
New York	1	
Washington	144	
	945	18,289

[1] No imports during 1949.

TECHNOLOGY

The Bureau of Mines continued its cooperation with anthracite producers in various mechanical mining studies being conducted in an attempt to increase the output of anthracite per man per day. At the close of World War II, as part of an experimental program to increase productivity, the Bureau obtained a Korfmann universal shearing machine from Germany and installed it in a mine in the Southern field of the anthracite region. The cutting tests with this equipment are the first to be made in the United States in steep-pitch mining. A report containing details of preliminary tests of the Korfmann universal shearing machine concludes that the machine's performance warrants additional experimental work.[3]

Practical research in pneumatic packing in underground workings, which has been practiced for many years in Europe and the United Kingdom, has been under way through the laboratory for some time. A Brieden pneumatic packing machine (German manufacture) was made available by the Bureau of Mines for test purposes and has been tested intermittently for more than a year.

Research is being conducted with scraper-shaker loaders devised and built by the Bureau for working in thin, steeply pitched anthracite beds. Experiments have also been conducted in longhole retreat mining, and future projects include research in the use of yielding steel props, block caving, and longhole drilling.

Stream pollution by mine drainage has been the subject of considerable study both by the mining industry and Government agencies. In the Pennsylvania anthracite industry, the major problem concerns satisfactory disposal of a daily average mine-water discharge of approximately 472 million gallons, containing considerable quantities of sulfuric acid. Diversion of individual mine drainage in the anthracite region from receiving streams or purification before entering streams are alternative remedial measures to combat pollution of surface streams by acid mine drainage. The daily drainage from the mines is a huge volume of water, and the effect of its removal from the surface streams coursing through and beyond the anthracite region is one of the phases that must be considered in any solution of the mine drainage problem. When collected and made available at one point, such as the portal of a drainage tunnel, it is a potentially valuable source of water supply for industrial or other utilization if its chemical quality can be improved to make it suitable for use. Bureau of Mines Bulletin 508 indicates the scope of the problem in the anthracite industry and gives some suggestions concerning its solution. Samples of water from mines in the region have been collected, analyzed, and studied and reports made thereon.[4]

Factual data regarding water impounded in underground pools and in abandoned strippings have been gathered by the Bureau's Anthracite Flood-Prevention Section. Recent studies and reports on pumping and field work concerning drainage tunnels have increased materially the information available on the mine-water problem.[5]

Bureau of Mines Bulletin 494 discusses a clay and gravel deposit known as the "buried valley" of the Susquehanna River, situated in the Northern field of the anthracite region near Wilkes-Barre, Pa. Geographically, the buried valley extends 15 miles from West Nanticoke upstream to the vicinity of West Pittston. The existence of the buried valley has been known for many years, and the uncertainty regarding the physical condition of water-bearing valley-fill deposits has made great care necessary in mining operations to avoid break-

[3] Buch, John W., and Allan, Andrew, Jr., Anthracite Mechanical Mining Investigations. Progress Report 3. Preliminary Testing of Korfmann Universal Shearing Machine, Model SK 20: Bureau of Mines Rept. of Investigations 4794, 1951, 11 pp.

[4] Ash, S. H., Felegy, E. W., Kennedy, D. O., and Miller, P. S., Acid-Mine-Drainage Problems, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 508, 1951, 114 pp.

[5] Discussed under "Research and Technology," p. 348, Minerals Yearbook 1949.

throughs between mine workings and the clay deposits. Whenever break-throughs have occurred, inundation of the underground workings has followed.

A large tonnage of anthracite has been mined beneath the buried valley, and a vast tonnage remains unmined. The materials that constitute the deep-filled deposits are water-bearing sediments consisting of alternating layers of gravel, sand, clay, and admixtures of all three. The main channel of the buried valley reaches its greatest depth near Plymouth, Pa., where the rock reaches a minimum altitude of 201 feet; the overlying mantle of valley-fill deposits is 320 feet deep at this spot.

Bulletin 494 furnishes data on the buried valley that should be useful in solving the anthracite mine-water problem and so conserving anthracite reserves and promoting employee safety. The report discusses physical characteristics of the valley, correlates pertinent data relating to the subject, presents accurate contour maps showing the position of the top of the solid rock underlying the valley fill, and gives cross sections at regular intervals across the valley showing the irregularities in thickness, configuration, and nature of the materials composing the water-bearing valley-fill deposits.[6]

The basic combustion research on the preparation and utilization of anthracite fines conducted by the School of Mineral Industries, Pennsylvania State College, and jointly supported by the Commonwealth of Pennsylvania and the Anthracite Institute, was continued in 1950.

The Anthracite Institute continued various research projects on fixed-bed silt gasification, upgrading of anthracite silt by pelletization, fluid-bed reduction of iron ore, anthratube performance, and fluidized and slagging gas producers.

WORLD PRODUCTION

World production of anthracite increased in 1950, although production in some of the European countries declined slightly. Table 39 presents details of world production, by countries, for 1946–50.

---

[6] Ash, S. H., Buried Valley of the Susquehanna River, Anthracite Region of Pennsylvania: Bureau of Mines Bull. 494, 1950, 27 pp.

TABLE 39.—World production of anthracite, in metric tons, 1946–50

[Compiled by Pauline Roberts]

Country	1946	1947	1948	1949	1950
Belgium [1]	4,783,000	5,121,000	5,853,000	5,839,000	5,712,000
Bulgaria [1]	27,000	27,000	27,000	27,000	30,000
China	757,114	878,062	[1] 600,000	[1] 1,000,000	[1] 2,000,000
France	8,313,230	8,041,874	[1] 7,700,000	[1] 9,000,000	[1] 8,800,000
French Morocco	221,750	268,500	290,300	341,417	367,868
Germany:					
Federal Republic [1]	3,876,900	5,215,900	6,183,000	7,433,000	7,974,000
Soviet Zone [1]	166,900	197,900	203,900	217,400	237,600
Indochina	261,696	247,777	355,000	378,600	494,416
Ireland	122,886	121,915	88,630	[1] 47,750	[1] 50,000
Italy	104,507	114,580	86,611	75,252	68,071
Japan	444,000	648,000	852,226	776,414	686,147
Korea:					
North [1]	830,000	1,340,000	1,500,000	1,500,000	1,500,000
South	241,770	475,190	799,000	1,039,000	[1] 600,000
New Zealand	2,308	1,632	1,773	1,915	1,991
Peru	82,089	82,045	42,288	27,994	33,000
Portugal [2]	379,526	370,147	386,763	443,456	425,987
Rumania	15,994	23,779	[1] 25,000	35,000	[1] 30,000
Spain	1,457,529	1,411,352	1,462,736	1,439,217	1,504,124
Switzerland	74,544	15,066	[1] 15,000	[1] 10,000	[1] 10,000
U. S. S. R.[1]	41,050,000	45,975,000	52,425,000	58.975,000	66,000,000
United Kingdom	3,547,742	3,656,967	3,859,974	3,783,364	[1] 4,000,000
United States (Pennsylvania)	54,890,625	51,881,632	51,836,218	38,738,150	39,985,503
Total (estimate)	121,650,000	126,120,000	134,600,000	131,100,000	140,500,000

[1] Estimated. [2] Low-grade anthracite.

Cobalt

By Hubert W. Davis and Charlotte R. Buck

GENERAL SUMMARY

CONSUMPTION of cobalt in the United States reached the unprecedented total of 8,283,408 pounds in 1950—a gain of 76 percent over 1949 and 65 percent greater than in the former record year 1948, when it exceeded 5,000,000 pounds for the first time. Usage of cobalt for all important purposes, except high-speed steel, was larger in 1950 than in 1949. Quantitywise, the gains were most pronounced for magnet alloys and cobalt-base high-temperature alloys; these two outlets accounted for 62 percent of the total quantity consumed in 1950 and utilized twice as much as in 1949. Noteworthy gains were also recorded in the use of cobalt in ground-coat frit for porcelain enamel, alloy hard-facing rods, cobalt-alloy steels, and pigments. So great was the demand for cobalt that voluntary rationing was initiated by suppliers in the third quarter of 1950, and beginning November 21 the National Production Authority limited civilian use of cobalt.

Despite the fact that the new supply of cobalt metal (rondelles and granules) made available in 1950 was 9 percent greater than in 1949, it was inadequate for industry requirements and stockpile commitments. The deficit was met partly by withdrawals from suppliers' stocks, which dropped from 1,667,000 pounds on January 1, 1950, to 271,000 pounds on December 31; partly by withdrawals from industry stocks, which declined from 842,900 pounds on January 1 to 599,800 pounds at the end of 1950; and partly by greater use of purchased scrap, which increased from 14,900 pounds in 1949 to 126,400 pounds in 1950. Although the new supply of oxide made available in 1950 was 79 percent larger than in 1949, it likewise was insufficient to meet industry demand, and suppliers' stocks declined 69 percent.

Sales of cobalt metal in the United States were 42 percent greater in 1950 than in 1949; sales to industry were 96 percent larger, but those to the National Stockpile were 10 percent smaller. The metal was supplied chiefly by imports but partly by production in the United States. Imports of metal in 1950 established a new high and were 20 percent greater than in 1949, but domestic production gained only 2.5 percent.

The demand for cobalt oxide increased substantially in 1950, chiefly because of greater use in ground coat for porcelain enamel and pigments. Output of oxide in the United States was up 20 percent, and imports were 2½ times greater. Production and shipments of salts and driers were also greater in 1950 than in 1949, but those of hydrate were smaller.

The greater part of the cobalt metal, oxide, hydrate, and other cobalt products sold in the United States is made from crude cobalt (white alloy) produced in Belgian Congo. Imports of white alloy from Belgian Congo were 8 percent more in 1950 than in 1949. Belgian Congo also supplies a substantial quantity of cobalt granules, which are produced from precipitates recovered from the solutions used in the electrolytic copper plants. Some of the cobalt products sold are made from domestic and Canadian ores. Output of domestic ore was 55 percent greater than in 1949, and imports of Canadian ore were up 61 percent. Consumption of cobalt white alloy and ore, however, declined 3 percent.

The price of cobalt metal and oxide remained unchanged throughout 1950.

Government Regulations.—On November 21, 1950, the National Production Authority issued a temporary directive (NPA–71) limiting the civilian use of cobalt metal during the rest of November to 30 percent of the average monthly quantity used by the buyer in the first half year. In December (NPA–77) civilian use was increased to 50 percent. On November 30 the National Production Authority (NPA Order M–10) established specific inventory limitations for cobalt. No person could receive delivery of cobalt if his inventory exceeded, or by such receipt would exceed, his minimum requirements for the succeeding 20 days at his then-scheduled method and rate of operation.

On December 30, 1950, the National Production Authority amended Order M–10, which in effect constituted a completely new order, inasmuch as the former Order M–10 contained only inventory-control provisions similar to those contained in the amended order. Amended Order M–10, after January 31, 1951, prohibited the use of cobalt in the manufacture of specified products that are relatively less essential or in which substitute materials may effectively be used; established limits on additions to inventory; and placed cobalt under allocation by prohibiting, subject to limited exceptions, any deliveries not covered by allocation authorization to be issued monthly by the National Production Authority.

DOMESTIC PRODUCTION

Mine Production.—Despite the fact that the United States is the largest consumer of cobalt in the world, only a small part of its requirements has been furnished by domestic ore, as is evident from table 1, which shows production and shipments through 1950.

Production of cobalt ore in the United States in 1950 was 55 percent greater than in 1949, but shipments were 2 percent less.

The Bethlehem Steel Co. was the only producer of commercial cobalt ore in the United States in 1950. The cobalt-bearing material (averaging 1.4 percent cobalt in 1950) is contained in the sulfides that accompany the magnetite mined at Cornwall, Pa. The cobalt-bearing material is shipped to the Pyrites Co., Wilmington, Del., where it is processed to metal and other cobalt products.

The Sullivan Mining Co., Kellogg, Idaho, continued to recover cobalt at its electrolytic zinc plant in 1950 but, as in previous years, made no shipments. In 1950 it recovered 183 short tons of residues containing 15,515 pounds of cobalt.

The St. Louis Smelting & Refining Division of National Lead Co. continued to produce an iron reject containing about 3 percent cobalt

TABLE 1.—Cobalt ore produced and shipped in the United States through 1950

Year	Produced: Gross weight (short tons)	Produced: Cobalt content (pounds)	Shipped from mines: Gross weight (short tons)	Shipped from mines: Cobalt content (pounds)
Previous to 1921 (partly estimated)	(1)	730,000	(1)	730,000
1921–32 (partly estimated)	93	9,300	41	5,000
1933	20	1,160		
1934	31	2,009		
1935	23	1,995		
1936	6	526		
1937	24	3,023		
1938	16	1,075		
1939	27	1,705		
1940	5,048	133,800	4,500	127,000
1941	19,127	505,377	20,031	521,627
1942	26,241	735,335	23,741	661,657
1943	27,103	732,098	28,541	763,772
1944	18,407	828,515	17,539	556,687
1945	19,770	1,099,654	17,528	1,281,681
1946	15,620	518,378	15,542	506,884
1947	22,348	645,295	23,442	676,612
1948	25,721	687,464	22,173	580,703
1949	19,599	521,656	25,175	673,773
1950	28,660	809,328	23,662	660,025
Total	(1)	7,967,693	(1)	7,745,421

[1] Data not available.

at its property near Fredericktown, Madison County, Mo. Inasmuch as no process is available at the plant at the present time for converting the material into salable products, it is stockpiled. For many years the company has studied the problem of making a successful recovery of separate products of cobalt, nickel, and copper from the iron rejects. The results of the research have led to a process which shows that the chemistry is sound and, consequently, a 50-ton plant (head feed) is planned.

The Calera Mining Co., a wholly owned subsidiary of the Howe Sound Co., continued underground development at its Blackbird mine near Salmon, Idaho. The ore carries about 0.6 to 0.8 percent cobalt, about twice as much copper, and a little gold. According to the Howe Sound Co.:[1]

Since this mine has been developed sufficiently for the practical purposes of initial production, no attempt to block out additional ore was made during the year. Considerable construction work continued and, except for the installation of machinery which is currently being received, the plant, as initially designed, is complete.

Research work in connection with the milling of the complex cobalt ore, and refining the cobalt product, continued. On the basis of information received, which has been carefully reviewed by Company metallurgists, and by a consulting metallurgist, the new refining process which was mentioned in last year's report has been accepted and the refinery will be designed and completed by the Chemical Construction Corporation, which is a subsidiary of the American Cyanamid Company.

During the year, after the acquisition of the refinery site, and in order to avoid any unnecessary delays, the building to house the refinery equipment was erected. An office building was built, as was a laboratory. Access roads to the refinery, which is about two miles west of Garfield, Utah, were improved. A railroad spur from the main line of the Union Pacific Railroad was installed. Grading and preparation of the site for the storage of the waste products of the process was completed, and a water line from Garfield was laid.

[1] Howe Sound Co., Annual Report: 1950, pp. 5-6.

Late in the year the Company was requested by officials of the United States Government to increase the capacity of both the mine plant and the refinery because of the critical shortage of cobalt. Your Directors have, therefore, agreed to increase the milling plant at the mine from a rated capacity of 600 tons to 1000 tons of ore per day and to proportionately enlarge the refinery so that its rated capacity will be in excess of 3,000,000 pounds of cobalt per year. The Company will undertake to finance the enlarged plants with its own funds and is negotiating contracts with the Government under which it will be assured of a market for a large portion of the cobalt to be produced during a five-year period.

No definite date for completion of the refinery can be given at this time. During this period of national emergency delivery of machinery and equipment may be delayed and the governing factors present unknown conditions which make time estimates difficult. It is believed, however, that if necessary priorities, which are to be obtained from the Government, are effective, this plant should be in operation before the end of the year. The milling plant at the mine will be ready for operation about July 1.

The Blackbird mine has been described in some detail in a business journal.[2]

An improved method of recovering the nickel and cobalt content from technical ammoniacal leach liquors containing compounds of such metals in solution with various unavoidable impurities has been developed.[3]

Refinery Production.—Consumption by refiners or processors of cobalt contained in alloy and ore was 2,526,755 pounds in 1950—a 3-percent decrease from 1949. However, usage of cobalt intermediates by refiners or processors was 70 percent greater. Of the alloy and ore consumed in 1950, much the greater part was utilized in making cobalt metal.

A patent[4] has been issued for the production of chemically pure cobalt metal.

TABLE 2.—Cobalt products produced and shipped in the United States, 1949–50, in pounds

Product	Production		Shipments	
	Gross weight	Cobalt content	Gross weight	Cobalt content
1949				
Metal	1,800,614	1,772,519	1,556,198	1,531,997
Oxide	439,150	310,521	387,654	274,724
Hydrate	419,248	167,033	410,432	165,682
Salts:				
Acetate	159,426	37,272	154,382	36,132
Carbonate	135,239	62,015	141,792	65,573
Sulfate	496,799	103,922	506,728	106,172
Other	24,577	5,786	28,716	7,114
Driers	8,301,277	490,360	8,284,863	491,395
1950				
Metal	1,850,145	1,817,550	2,280,321	2,240,834
Oxide	522,666	371,215	570,394	404,618
Hydrate	262,479	107,771	271,076	110,917
Salts:				
Acetate	199,385	46,673	199,969	46,806
Carbonate	205,986	94,760	212,100	97,591
Sulfate	839,500	178,231	777,549	165,314
Other	47,620	11,366	48,629	12,589
Driers	12,471,700	766,712	12,450,974	764,839

[2] Huttl, J. B., Howe Sound's Cobalt Mine Rapidly Nearing Production: Eng. and Min. Jour., vol. 151, No. 10, October 1950, pp. 89-91.

[3] Hills, Robert, and Dufour, Maurice F. (assigned to Nicaro Nickel Co.), Recovery of Nickel and Cobalt Compounds: United States Patent 2,531,336, Nov. 21, 1950.

[4] Mantell, Charles L. (assigned to Reduction and Refining Co.), Production of Chemically Pure Cobal Metal: United States Patent 2,506,159, May 2, 1950.

TABLE 3.—Cobalt consumed [1] by refiners or processors in the United States, 1945–50, in pounds of contained cobalt

Cobalt material	1945	1946	1947	1948	1949	1950
Alloy and ore	4,808,825	2,009,018	2,672,991	2,715,605	2,607,281	2,526,755
Fines and granules	453,538	499,737	528,544	393,725	422,493	856,042
Rondelles	64,872	148,197	128,937	107,520	95,759	137,822
Hydrate	133,831	128,740	152,102	150,826	129,444	80,497
Carbonate	18,460	19,243	6,904	4,608	2,664	13,944
Other					17,565	48,261

[1] The fines, granules, rondelles, hydrate, and carbonate consumed originated from alloy and ore; therefore, combining alloy and ore with these materials would result in duplication.

CONSUMPTION

Consumption of cobalt by industrial consumers established a new record in 1950; it was 8,283,408 pounds, a 76-percent gain over 1949 and 65 percent larger than in 1948, the previous record year. Usage of cobalt for all important purposes, except high-speed steel, was larger in 1950 than in 1949. Magnet alloys continued to be the largest single use for cobalt and represented 35 percent of the total quantity consumed in 1950; usage for this purpose, moreover, was 132 percent greater than in 1949.

The second-largest use of cobalt was for cobalt-chromium-tungsten-molybdenum alloys, which accounted for 27 percent of the total quantity consumed in 1950; moreover, usage for this purpose was 80 percent greater than in 1949. The popular grades of cobalt-base, high-temperature, jet-engine alloys, in order of their decreasing strategic alloy index, are shown in table 4.[5]

A high-temperature, high-strength alloy, which contains 58 to 63 percent cobalt, has been developed.[6]

A high-alloy sheet, for use at temperatures up to 1,800° F., has been based on cobalt (50 percent), chromium, nickel, and tungsten.[7]

TABLE 4.—Cobalt-base, high-temperature, jet-engine alloys

Designation of alloy	C	Cr	Ni	Co	Mo	W	Cb	Ti	Fe	Other
S-816	0.4	20	20	44	4	4	4		3	
MIT NT-2	1	20	30	20	3	2.2			21	Ta 2
S-590	.4	20	20	20	4	4	4		25	
61	.4	28	1	67		5				
NR-88 (Co-Cr [9W])	.4	23	3	63		9				
Vitallium	.25	28	2.5	62	5.5				1	
X-40	.5	25	10	55		7			.6	
422-19	.4	26	15	51	6					
NR-90 (Co-Cr-Ni [5Mo.5W])	.4	23	18	46	5	5				
N-155	.3	20	20	20	3	2	1		.32	N_2 0.11
6059	.4	26	33	33	5					
K-42-B	.05	18	42	22				2.2	14	Al .2
Refractalloy 26	.05	18	37	20	3			2.8	18	Al .2

[5] Iron Age, vol. 167, No. 1, Jan. 4, 1951, p. 340.
[6] Epremian, Edward (assigned to General Electric Co.), High-Temperature Cobalt Alloy: United States Patent 2,515,775, July 18, 1950.
[7] Binder, W. O., and Spendelow, H. R., Jr., New Cobalt-Base Alloy for High-Temperature Sheet: Material Progress, vol., 57, No. 3, March 1950, pp. 321–326.

More cobalt was also used in cemented carbides, alloy hard-facing rods, pigments, and in ground-coat frit for porcelain enamel than in 1949, and cobalt salts and driers were utilized at a rate about 44 percent greater. The use of cobalt oxide as an ingredient in ground-coat frit has been described.[8] Less cobalt was used for high-speed steel in 1950 than in 1949 but this loss was more than offset by greater utilization in other cobalt-alloy steels. An informative article on super-high-speed steels was made available.[9]

Elgiloy, a cobalt-chromium-nickel alloy, developed primarily for watch springs, is reported [10] to have found many applications outside of its original use.

TABLE 5.—Cobalt consumed in the United States, 1946–50, by uses, in pounds of cobalt

Use	1946	1947	1948	1949	1950
Metallic:					
High-speed steel	224, 049	223, 148	289, 391	283, 496	235, 227
Other steel	201, 949	[1] 87, 719	[1] 132, 803	[1] 162, 638	252, 885
Permanent-magnet alloys	1, 463, 539	1, 016, 147	1, 352, 371	1, 194, 920	2, 834, 040
Soft-magnetic alloys				42, 965	37, 552
Cast cobalt-chromium-tungsten-molybdenum alloys	526, 504	[1] 941, 087	[1] 1, 196, 608	[1] 1, 238, 083	2, 226, 199
Alloy hard-facing rods and materials	53, 874	71, 545	116, 313	82, 965	260, 371
Cemented carbides	45, 100	51, 917	85, 314	118, 522	136, 935
Other metallic	81, 988	99, 476	115, 255	116, 344	208, 574
Total metallic	2, 597, 003	2, 491, 039	3, 288, 055	3, 239, 933	6, 191, 783
Nonmetallic (exclusive of salts and driers):					
Ground-coat frit	412, 766	607, 316	613, 745	424, 051	683, 358
Pigments	170, 662	207, 928	232, 725	188, 606	262, 441
Other nonmetallic	39, 596	51, 439	66, 699	84, 336	43, 826
Total nonmetallic	623, 024	866, 683	913, 169	696, 993	989, 625
Salts and driers: Lacquers, varnishes, paints, inks, pigments, enamels, glazes, feed, electroplating, etc. (estimate)	885, 000	797, 000	818, 000	765, 000	1, 102, 000
Grand total	4, 105, 027	4, 154, 722	5, 019, 224	4, 701, 926	8, 283, 408

[1] Revised figure.

TABLE 6.—Cobalt consumed in the United States, 1946–50, by forms, in pounds of cobalt

Form	1946	1947	1948	1949	1950
Metal	2, 598, 796	2, 542, 174	3, 321, 516	3, 311, 229	6, 087, 048
Oxide	510, 637	794, 372	850, 255	606, 510	964, 055
Cobalt-nickel compound	94, 201	13, 810	9, 413	4, 315	3, 434
Ore and alloy	8, 569	2, 229			436
Purchased scrap	7, 824	5, 137	20, 040	14, 872	126, 435
Salts and driers	885, 000	797, 000	818, 000	765, 000	1, 102, 000
Total	4, 105, 027	4, 154, 722	5, 019, 224	4, 701, 926	8, 283, 408

PRICES

Prices of cobalt metal and oxide were unchanged throughout 1950. Cobalt metal (97–99 percent, in kegs of 550 pounds) was $1.80 a

[8] Clauser, H. R., Porcelain Enamels: Materials & Methods, vol. 31, No. 2, February 1950, pp. 75–76.

[9] Leckie-Eweing, P., Super High-Speed Steels Set New Production Record: Iron Age, vol. 166, No. 23, Dec. 7, 1950, pp. 115–118.

[10] Rose, Kenneth, Highly Corrosion Resistant Spring Material Finds Varied Use: Materials & Methods, vol. 32, No. 3, September 1950, pp. 54–55.

pound delivered east of Chicago; for quantities under 100 pounds it was $1.87 a pound. Metallurgical-grade oxide was $1.95 a pound of contained cobalt f. o. b. Niagara Falls, N. Y., and ceramic-grade oxide was $1.38 a pound (gross weight) east of the Mississippi River. The prices for metal and ceramic-grade oxide have been in effect since April 1, 1949, and that for metallurgical-grade oxide since November 17, 1949.

FOREIGN TRADE [11]

Imports.—Imports of cobalt into the United States established a new high in 1950 and were 22 percent larger than in 1949 and 3 percent greater than in 1948, the previous record year. Belgian Congo continued to be the chief source of imports; in 1950 it supplied 3,918,225 pounds of metal and 3,979,088 pounds of white alloy containing 1,792,348 pounds of cobalt. Belgium supplied 2,788,650 pounds of metal and 863,800 pounds of oxide containing 613,300 pounds of cobalt; both the metal and oxide were produced from Belgian Congo alloy. Canada supplied 69 pounds (gross weight) of oxide, 2,000 pounds (gross weight) of salts and compounds, and 164,188 pounds of ore containing 18,838 pounds of cobalt. The United Kingdom supplied 40,781 pounds (gross weight) of oxide and 2,649 pounds (gross weight) of salts and compounds.

TABLE 7.—Cobalt imported for consumption in the United States, 1946–50, by classes

[U. S. Department of Commerce]

Year	Alloy [1] (pounds)		Ore		
	Gross weight	Cobalt content	Pounds: Gross weight	Pounds: Cobalt content	Value
1946	1,648,595	717,337	[2] 657,787	[2] 73,892	[2] $59,861
1947	3,751,452	1,640,952	751,438	77,721	58,920
1948	4,879,413	2,179,473	8,167,545	870,519	647,000
1949	3,691,051	1,657,788	109,009	11,965	9,344
1950	3,979,088	1,792,348	164,188	18,838	16,003

Year	Metal		Oxide		Salts and other compounds	
	Pounds	Value	Pounds (gross weight)	Value	Pounds (gross weight)	Value
1946	1,935,582	$2,749,326	1,074,630	$1,450,236	350	$778
1947	[3] 6,035,153	[3] 7,994,347	752,150	753,916	530	1,856
1948	[3] 5,266,521	7,743,679	790,300	828,667	1,374	4,514
1949	5,588,327	9,025,595	360,318	384,879	359	1,167
1950	[3] 6,706,875	[3] 11,210,872	[3] 904,650	[3] 1,009,431	4,649	5,927

[1] Reported by importer to Bureau of Mines; not separately classified by U. S. Department of Commerce. Value not available.
[2] Data adjusted by Bureau of Mines to exclude alloy.
[3] Adjusted by Bureau of Mines.

[11] Figures on imports and exports (unless otherwise indicated) compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Historical table 8 shows imports of cobalt for 1923–50, by classes. Corresponding figures for earlier years are not available. However, imports of cobalt apparently did not exceed 500,000 pounds annually until 1926; from that year they increased steadily through 1929, when they reached 1,212,000 pounds. Imports declined abruptly during 1930–32, dropping to 303,000 pounds in 1932. Since 1933, however, imports of cobalt have increased almost steadily and reached an all-time high of 9,095,000 pounds in 1950.

During the 28 years 1923–50, receipts of metal comprised about 46 percent of the cobalt imports, most of which were supplied by Belgium and Belgian Congo. Smaller quantities of metal have been received from Austria, Canada, Finland, France, Germany, Japan, Sweden, and United Kingdom. Imports of alloy represented the second-largest quantity (38 percent), and virtually all was from Belgian Congo. About 11 percent of the imports of cobalt have been in the form of oxide, chiefly from Belgium. Substantial quantities of oxide have also been received from Germany and Canada, and smaller quantities from Australia, Finland, and France. Receipts of cobalt ore have comprised about 5 percent of the total imports; Canada has been the largest source, and most of the remainder came from Australia and French Morocco.

TABLE 8.—Cobalt imported for consumption in the United States, 1923-50, in pounds

Year	Gross weight					Total	
	Alloy	Ore	Metal	Oxide	Sulfate and other compounds	Gross weight	Cobalt content (estimated)
1923		58,719	225,639	258,574	45,644	588,576	426,000
1924		28,786	118,952	226,703	797	375,238	283,000
1925		34,782	198,669	287,265	13,256	533,972	408,000
1926		154,468	387,076	333,132	37,342	912,018	642,000
1927		60,382	407,198	369,747	55,127	892,454	680,000
1928		107,498	535,817	364,154	68,281	1,075,750	819,000
1929		434,443	806,640	475,928	64,782	1,781,793	1,212,000
1930		199,642	460,251	425,881	55,303	1,141,077	794,000
1931		83,895	164,967	321,891	46,317	617,070	410,000
1932		27,193	123,112	225,896	92,098	468,299	303,000
1933		556,119	281,713	568,057	99,231	1,505,120	769,000
1934	439,476	748,513	506,119	328,730	43,787	2,066,625	1,000,000
1935	378,848	419,110	563,866	557,083	80,554	1,999,461	1,167,000
1936		1,039,760	883,377	813,642	46,658	2,783,437	1,580,000
1937		587,499	1,073,129	842,847	56,585	2,560,060	1,734,000
1938		449,984	938,476	373,215	41,867	1,803,542	1,249,000
1939		611,083	2,130,296	680,644	76,664	3,498,687	2,665,000
1940	7,843,828	2,653,891	130,321	756,759	11,468	11,396,267	4,200,000
1941 [1]	9,970,589	2,443,725	554,030	38,002	4,980	[1] 13,011,326	[1] 4,328,000
1942	10,313,867	834,797	148,304		200	11,297,168	4,280,000
1943	10,110,879	10,556,042	266,670	58,928	56	20,992,575	5,626,000
1944	8,500,516	473,529	73,088	225,609	115	9,272,857	3,798,000
1945	8,397,145	859,940	946,475	120,672	224	10,324,456	4,615,000
1946	1,648,595	657,787	1,935,582	1,074,630	350	5,316,944	3,451,000
1947	3,751,452	751,438	6,035,153	752,150	530	11,290,723	8,206,000
1948	4,879,413	8,167,545	5,266,521	790,300	1,374	19,105,153	8,821,000
1949	3,691,051	109,009	5,588,327	360,318	359	9,749,064	7,458,000
1950	3,979,088	164,188	6,706,875	904,650	4,649	11,759,450	9,095,000

[1] In addition to classes shown, 4,796,000 pounds of Burmese speiss containing 335,721 pounds of cobalt were imported.

Exports.—Exports of cobalt from the United States are small; 159,294 pounds of metal (chiefly scrap) valued at $81,805 were exported in 1950. Some oxide, salts, and driers are also exported, but the figures are not separately recorded by the United States Department of Commerce.

Tariff.—The duty on cobalt oxide continued to be 10 cents a pound, sulfate 5 cents a pound, linoleate 10 cents, and other salts and compounds 30 percent ad valorem. Cobalt metal and ore entered the United States duty-free.

WORLD REVIEW

Virtually all cobalt is found associated with other metals, such as copper, nickel, iron, arsenic, lead, zinc, manganese, silver, and gold. Belgian Congo and Northern Rhodesia, where cobalt occurs associated with copper, have been the chief producing countries in recent years, followed by the United States, Canada, and French Morocco. These five countries have contributed about 95 percent of the world output of cobalt in recent years. Iron pyrites from Finland, Germany, Greece, Italy, Norway, Spain, and Sweden contains cobalt, some of which is recovered. Although the quantities of cobalt present in iron pyrites are generally very small—often only 0.05 percent—and its recovery is only 50 to 60 percent, the very large tonnage treated during and preceding the war contributed greatly to the cobalt production in Germany. It is reported [12] that about 10 tons of cobalt concentrates are obtained from 100,000 tons of cinder. A complete record of output of cobalt from iron pyrites is lacking.

TABLE 9.—World mine production of cobalt, by countries, 1941–50, in metric tons of contained cobalt [1]

[Compiled by Berenice B. Mitchell]

Country [1]	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Australia	13	14	15	9	9	10	8	10	9	10
Belgian Congo	2,256	1,656	2,061	1,877	2,800	2,150	3,563	4,322	4,350	5,148
Bolivia (exports)	2	(2)	(2)	-----	-----	-----	-----	-----	-----	(3)
Burma	73	-----	-----	-----	-----	-----	-----	-----	-----	-----
Canada [4]	119	38	80	16	49	34	260	701	281	284
Chile	2	(2)	3	5	1	-----	-----	-----	-----	(3)
Finland	(3)	98	79	86	84	101	50	(3)	(2)	(3)
Italy	81	69	27	7	6	-----	-----	(2)	(2)	(3)
Japan	(2)	1	3	15	11	7	6	(2)	-----	-----
Morocco, French	65	3	216	243	98	188	212	221	209	390
Northern Rhodesia [5]	650	914	943	978	874	552	420	367	402	670
Sweden	-----	-----	-----	-----	9	-----	-----	-----	(3)	(3)
United States (shipments)	237	300	346	253	581	230	307	263	306	299
Total (estimate)	4,000	3,500	4,200	3,900	4,700	3,500	5,000	6,100	5,900	7,100

[1] In addition to countries listed, Brazil, China, Germany, and Spain produce cobalt, but production data are not available. Estimate by author of chapter included in total.
[2] Less than 1 ton.
[3] Data not available; estimate by author of chapter included in total.
[4] Figures comprise Canadian ore processed in Canada and exported (irrespective of year when mined), plus cobalt content of concentrates made at Port Colborne from copper-nickel ore. However, figures exclude the cobalt recovered at Clydach (Wales) from Canadian nickel-copper ores, for which estimate by author of chapter has been included in world total.
[5] Year ended June 30 of year stated.

[12] Dennis, W. H., Recovery of Nonferrous Metals from Pyrite: Mine and Quarry Eng. (London), vol. 13, No. 12, December 1947, pp. 358–362.

TABLE 10.—Cobalt contained in ores produced in Belgian Congo and Canada and cobalt alloy produced in Northern Rhodesia, from earliest production to 1950

Year	Belgian Congo (metric tons)	Canada [1] (short tons)	Year	Belgian Congo (metric tons)	Canada [1] (short tons)	Northern Rhodesia [2] (short tons)	
						Alloy	Cobalt content
1904	---	16	1929	700	465	---	---
1905	---	118	1930	700	347	---	---
1906	---	321	1931	370	261	---	---
1907	---	739	1932	335	245	---	---
1908	---	1,224	1933	618	233	33	18
1909	---	1,533	1934	---	297	988	509
1910	---	1,098	1935	17	341	1,130	586
1911	---	852	1936	685	444	1,080	523
1912	---	934	1937	1,500	254	1,274	637
1913	---	821	1938	1,532	230	2,854	1,183
1914	---	351	1939	1,080	366	4,511	1,761
1915	---	206	1940	2,301	397	3,291	1,348
1916	---	400	1941	2,256	132	1,785	717
1917	---	337	1942	1,656	42	2,484	1,008
1918	---	380	1943	2,061	88	2,582	1,040
1919	---	298	1944	1,877	18	2,662	1,078
1920	---	283	1945	2,800	55	2,415	963
1921	---	126	1946	2,150	37	1,527	609
1922	---	285	1947	3,563	286	1,225	463
1923	---	444	1948	4,322	772	1,081	405
1924	273	474	1949	4,350	[3] 310	1,171	443
1925	192	558	1950	5,148	313	1,954	739
1926	360	332					
1927	558	440	Total	41,854	18,981	34,047	14,030
1928	450	478					

[1] Excludes cobalt in Canadian copper-nickel ores refined at Clydach, Wales.
[2] Year ended June 30 of year stated.
[3] Revised figure.

Belgian Congo.—The world's premier source of cobalt continues to be Belgian Congo, where the Union Minière du Haut-Katanga is the sole producer. Output was 5,148 metric tons in 1950, a new record. Commissioning of a new hydroelectric power station and more normal rainfall contributed to the gain in output. Production of cobalt in Belgian Congo was begun in 1924; since that year output has increased almost without interruption, and total production through 1950 has been about 41,854 metric tons, as shown in table 10.

The Union Minière du Haut-Katanga has six electric furnaces of 720 kw. each and has recently installed a 2,000-kw. furnace at Jadotville for smelting cobalt ores and concentrates from the Kamoto, Musonoi, and Luiswishi open-pit mines. The cobalt content of low-grade ore from the Kamoto mine is raised simply by washing, and the washed ore is sent either directly to the electric furnaces at Jadotville or to the concentrator at Kolwezi, depending upon the content. The vast Musonoi copper-cobalt deposit contains large veins, especially rich in cobalt, which, in spite of the mixture of ores, are worked separately by selective mining. The Musonoi ore is sent to the Kamoto washing plant or to the Kolwezi concentrator, thence to Jadotville. The mixed copper-cobalt ore from the Luiswishi mine is sent directly to Jadotville. The cobalt and copper obtained from smelting the cobalt-rich ores and concentrates are blended with other metals contained in the charge to form two alloys—a red alloy rich in copper and poor in cobalt and a white alloy rich in cobalt and iron but containing about 15 percent copper. The red alloy is treated in rotary furnaces at Lubumbashi to yield a cobaltiferous slag, which is returned to the electric furnaces. The white alloy, containing about 45 percent cobalt, is cast into ingots, which are sent to Belgium and the United States for refining.

Certain Katanga copper ores also contain cobalt. The ores and concentrates that are poorest in cobalt are sent to the electrolytic copper plant, also at Jadotville, where the cobalt enters into solution simultaneously with the copper. The cobalt precipitates are treated by electrolysis in a refining plant capable of producing 2,000 tons of granules annually. The cobalt is produced in the form of cathodes, which are melted and refined; the cobalt is then granulated and packed in drums for export.

On the basis of a rate of production of 4,000 metric tons annually, the company reported reserves of cobalt adequate for 40 to 50 years, and it anticipates that these reserves will increase as a result of further development of its copper deposits.

Canada.—Production of cobalt in Canada is measured by the quantities of Canadian ores processed and exported, irrespective of the year when mined, plus the cobalt content of concentrates produced by the International Nickel Co. of Canada, Ltd., at Port Colborne, Ontario. Canadian production figures, however, do not include the cobalt recovered by Mond Nickel Co. at its Clydach (Wales) nickel refinery from the nickel-copper ores of the Sudbury district.

According to the Dominion Bureau of Statistics, production of cobalt (content) in Canada was 626,400 pounds in 1950 compared with 619,065 pounds (revised figure) in 1949. Production figures on cobalt in Canada from 1904 through 1950 are shown in table 10.

In the cobalt area of northern Ontario, the Mensilvo Mines, Ltd., and Silanco Mining & Refining Co., Ltd., were the chief producers of cobalt ore in 1950. The smelter of the Cobalt Chemical & Refinery Co., Ltd., was damaged by fire in May 1950. In an effort to stimulate production of cobalt ore in northern Ontario, Deloro Smelting & Refinery Co. announced in mid-December an increase of 15 to 30 cents per pound of cobalt, depending on grade. Under the new price schedule an ore containing 10 percent cobalt will bring 80 cents per pound for the cobalt contained and a 15-percent ore, $1.10.

The International Nickel Co. of Canada, Ltd., continued to recover impure cobalt concentrates at its Port Colborne refinery; they are shipped to Clydach, Wales, for refining.

Falconbridge Nickel Mines, Ltd., continued to construct at its nickel refinery at Kristiansand, Norway, a plant to produce cobalt from the matte yielded by Sudbury nickel-copper ores. Production of cobalt is expected to begin the latter part of 1951.

During 1950, Eldorado Mining & Refining (1944), Ltd., produced byproduct cobalt-nickel speiss at its Port Hope refinery from pitchblende mined at Port Radium, Northwest Territory. The speiss averages about 14 percent cobalt.

French Morocco.—Production of cobalt ore in French Morocco was 3,509 metric tons containing 390 tons of cobalt in 1950 compared with 1,739 tons containing 209 tons of cobalt in 1949. La Société Minière de Bou-Azzer et du Graara, Casablanca, is the sole producer.

On October 11, 1950, the Economic Cooperation Administration announced an agreement with the French Government under which a commercial contract had been concluded for shipping 7,200 tons of cobalt concentrates up to November 1, 1952, by the producer. The concentrates, which contain about 12 percent cobalt, as well as some nickel, gold, and silver, will be refined to metal for the Economic Cooperation Administration by Deloro Smelting & Refining Co. at Deloro, Ontario, Canada.

Mexico.[13]—It is reported that eight concessions have been granted by the Ministry of National Economy for exploitation of cobalt and manganese-bearing tracts in Oaxaca.

Northern Rhodesia.—The second-largest producer of cobalt in the world continues to be Northern Rhodesia, where the Rhokana Corp., which has been producing cobalt since 1933, is the sole producer. The output of alloy was 1,954 short tons containing 739 tons of cobalt in the year ended June 30, 1950, compared with 1,171 tons containing 443 tons in 1949. The gain resulted from an improvement in the grade of cobalt in ore, which averaged 0.137 percent in 1950 compared with 0.104 percent in 1949. To improve the percentage of recovery and produce a commodity suitable for the market without further treatment, Rhokana Corp. is erecting an electrolytic cobalt refinery on its property in Northern Rhodesia. The plant, which is expected to begin production in the second half of 1951, is designed for a production of 1,500 short tons of electrolytic cobalt metal annually. Laboratory and pilot-plant investigations on the production of electrolytic cobalt from a flotation concentrate recovered by the Rhokana Corp., which led to the construction of the refinery, have been described.[14] Production figures on cobalt in Northern Rhodesia from 1933 through 1950 are shown in table 10.

United Kingdom.—A comprehensive report on cobalt refining at the Rainham Works of Murex, Ltd., England, has been made available.[15]

[13] Mining World, vol. 12, No. 8, July 1950, p. 51.
[14] Talbot, H. L., and Hepker, H. N., Investigations on the Production of Electrolytic Cobalt from a Copper-Cobalt Flotation Concentrate: Inst. Min. and Met. (London), Bull. 514, September 1949, pp. 1–19.
[15] Bryant, P. S., Cobalt Refining at Rainham Works of Murex, Ltd. (Proceedings of a Symposium Held in London in July 1949): Inst. Min. and Met. (London), 1950, pp. 259–279.

Coke and Coal Chemicals

By J. A. DeCarlo, J. A. Corgan, and Maxine M. Otero

GENERAL SUMMARY

COKE is a basic raw material, which, because of its indispensability to iron and steel production, occupies a very important position in the industrial potential of the United States. Output of oven and beehive coke in 1950 totaled 72,718,038 net tons, 14 percent over 1949 but 3 percent less than the record output in 1948. The gain in production over 1949 would have been greater had all ovens available and in working condition operated at normal rates during the year. However, the 3-day workweek during the first quarter of the year and several work stoppages for varying periods in the bituminous-coal industry hampered coke-oven operations, thereby reducing production in that quarter. Coking coal began to move into coke plants when the bituminous-coal miners returned to work March 6, 1950, and production rates for both oven and beehive coke increased rapidly. Oven-coke plants, which had operated at 78.6 percent of capacity during the first quarter, increased production to 95.3 percent in the last quarter. Virtually all of the beehive ovens that were idle during the 3-day workweek and many that had not been active for many years were reactivated, and the daily average output of 5,300 tons during the first quarter of 1950 increased to 21,100 tons in the last quarter.

High consumer demand, created by the outbreak of war in Korea, accelerated requirements for durable goods; consequently, the demand for coke by metallurgical industries increased rapidly in the last half of the year. Metallurgical operations in 1950 required the greatest proportion of coke output since 1924. Roughly, 88 percent of the oven-coke production was utilized by iron blast furnaces and foundry cupolas. One of the outstanding developments during 1950 in the consumption pattern of oven coke was the decline in its use for the manufacture of water gas. This use rose rapidly during World War II because of the need for large quantities of water gas for chemicals. However, it is now expected that the use of coke for this purpose will continue to decline owing to the availability of natural gas both for chemical synthesis and as a fuel. In 1950 several gas utilities using coke for water-gas manufacture changed over to the distribution of natural gas, and facilities were under construction at some large chemical plants to use natural gas instead of coke as a raw material for chemical synthesis. Beehive ovens, which traditionally produce coke for metallurgical purposes, shipped 93 percent of their production to blast furnaces and foundries and only 7 percent for all other uses. The use of coke for household heating (domestic) has been decreasing steadily during the past decade, largely because of the increased requirements of metallurgical coke and also because of competition from oil and natural gas. The quantity of coke used for residential

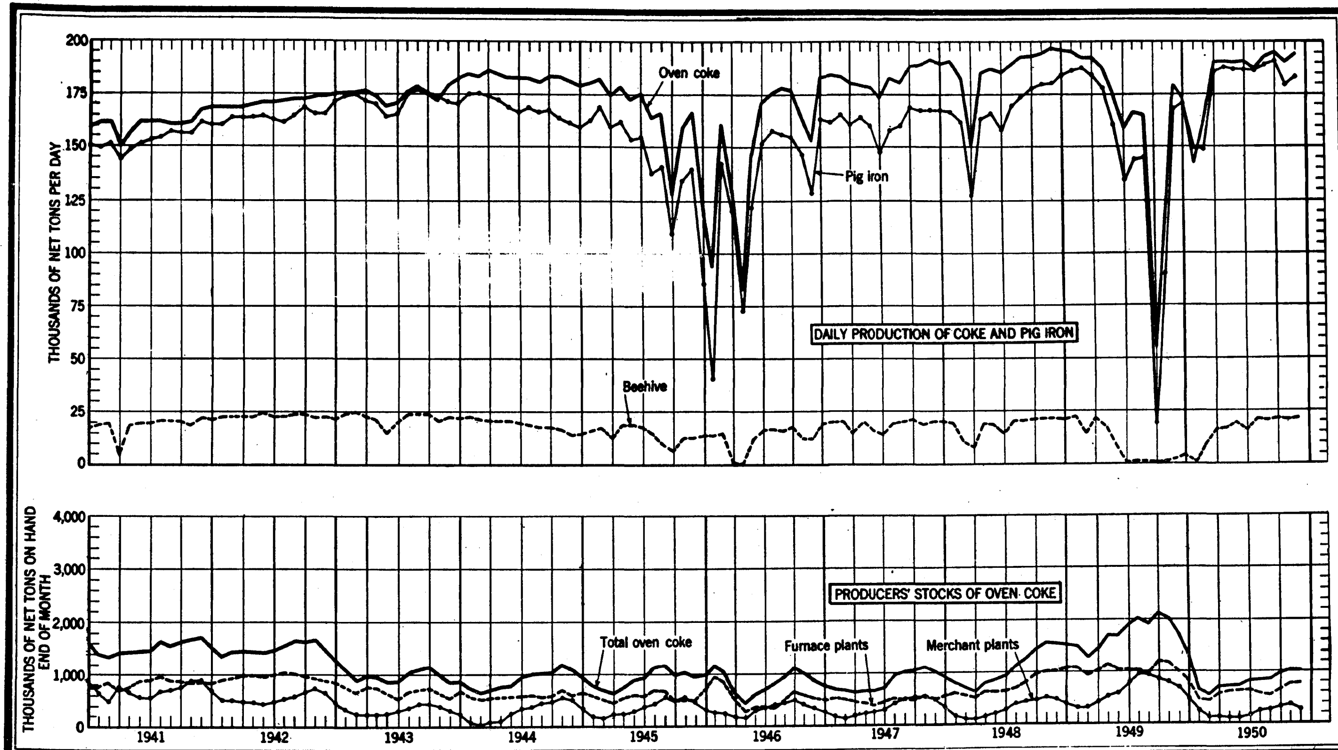

FIGURE 1.—Average daily production of oven and beehive coke and pig iron and producers' stocks of oven coke, 1941–50, by months.

heating was equivalent only to 4 percent of the total coke output, whereas 14 percent of the 1940 output was used for household heating.

One of the most pressing problems in the national defense program in 1950 was the matter of coke-oven capacity. The reason for this is that adequate coke capacity is essential for meeting steel-production goals. Roughly, 40 percent of the coking capacity in existence at the end of 1950 was built before and during World War I. Many of these ovens are in poor condition because of the long years of service and the extremely high rate of coke production that has been maintained continuously (except for short periods due to work stoppages) since the beginning of World War II. Oven failures, which exceeded new construction in 1949, continued in 1950. Although 574 new ovens were constructed and placed in operation during the year, 696 old ovens were taken out of production, resulting in a net decline of 1,222,000 net tons in actual capacity. The volume of new construction in 1950 was limited by the availability of silica brick and other essential construction materials. There were 706 new ovens under construction on December 31, 1950, and contracts were pending on several other batteries.

Approximately 80 percent of the total operating cost of a coke plant is represented by the delivered cost of coal. This, in turn, has a definite influence on the prices of coke and related products as, roughly, 1½ tons of bituminous coal are required to make 1 ton of coke Delivered costs of coal to both oven- and beehive-coke-plant operators increased in 1950, although the average value f. o. b. mines for the bituminous industry declined slightly. The average cost of coal delivered to oven-coke plant operators increased $0.15 per ton, or 2 percent, while costs of coal to beehive plants increased $0.28, or 5 percent. These rises generally resulted in higher prices for coke. Average receipts per ton of oven coke sold (merchant sales) increased for all grades except "other industrial", the increases ranging from $0.10 per ton for "domestic" to $1.56 for "water gas." The average realization for coke classified as "other industrial" declined $0.40. For beehive coke, slight increases were registered on sales for furnace, domestic, and miscellaneous industrial uses, while coke for foundry and water-gas uses declined.

According to the Bureau of Mines survey of employment in the coke industry in 1950, an average of 20,942 men worked 60,593,087 man-hours in the oven-coke industry. The number of workers decreased 199 from 1949, but the man-hours worked increased 1,770,848. In the beehive industry the number of men employed increased from 3,330 in 1949 to 3,405 in 1950, and the man-hours worked increased from 3,623,543 to 5,267,918. There has been a definite improvement in productivity at oven-coke plants since World War I. In 1918, 2.21 man-hours were required to produce 1 ton of oven coke, whereas only 0.91 man-hour was required in 1950. For the beehive plants there has also been a considerable increase in output per man-hour, as only 0.90 man-hour was required to produce 1 ton of coke in 1950 compared with 1.40 in 1918. The increased efficiency in the coke industry is due largely to improvements in equipment. Productivity in the oven-coke industry is considerably understated by the statistics, since employment on coke production as such cannot be separated from employment in the chemical-recovery plants; if the relevant man-hours were segregated, the figure on man-hours per ton for oven coke would be considerably lower than that for beehive.

Recovery of the principal coal-chemical materials depends on the rate of oven-coke production. The 11-percent gain in oven-coke production over 1949 increased the output of gas, tar, crude light oil, and ammonia. Coke-oven-gas production increased 11 percent; tar, 10 percent; crude light oil, 14 percent; and ammonia, 9 percent. Yields of coke-oven gas and crude light oil per ton of coal charged improved over 1949; but yields of tar and ammonia declined slightly. Benzene (benzol) was one of the coal chemicals that received a great deal of attention, both by Government and industry. This commodity, used mostly as a motor fuel before World War II, has become one of the Nation's most important chemical raw materials. Benzene goes into the making of styrene for synthetic rubber, polystyrenes and phenolics for plastics, dimethylaniline and picric acid for explosives, DDT for insect control, and for nylon, aniline dyes, and synthetic detergents. More benzene was used for styrene alone in 1950 than for all chemical purposes in 1940. Government and industry forecasts of future benzene requirements are far larger than the coke industry can produce, allowing for moderate increases commensurate with steel expansion. For this reason, in January 1951, the Government requested the petroleum industry to build facilities to produce about 100,000,000 gallons of benzene from petroleum as rapidly as possible. In 1950 the coke industry supplied 83 percent of the United States production of chemical grades of benzene, tar distillers supplied 12 percent, and 5 percent was produced from petroleum. Total value of coke and breeze produced and sales of coal-chemical materials totaled $1,278,823,829, the highest on record.

TABLE 1.—Salient statistics of the coke industry in the United States, 1937 and 1947–50

	1937	1947	1948	1949	1950
Coke production:[1]					
Oven net tons	49, 210, 748	66, 758, 549	68, 284, 357	60, 222, 481	66, 890, 618
Beehive do	3, 164, 721	6, 687, 301	6, 577, 571	3, 414, 948	5, 827, 420
Total do	52, 375, 469	73, 445, 850	74, 861, 928	63, 637, 429	72, 718, 038
Percent oven	94. 0	90. 9	91. 2	94. 6	92. 0
Producers' stocks of coke, end of year net tons	2, 595, 287	1, 032, 237	1, 593, 441	1, 769, 456	1, 110, 714
Exports, all coke do	526, 683	835, 059	706, 782	548, 256	397, 846
Imports, all coke do	286, 364	104, 093	161, 400	277, 507	437, 585
Apparent consumption, all coke do	51, 271, 929	72, 611, 413	73, 755, 342	63, 190, 665	73, 416, 519
Disposal, all coke sold or used:					
Blast furnace do	36, 751, 969	57, 636, 505	59, 285, 506	51, 514, 853	60, 918, 549
Foundry do	2, 038, 822	3, 650, 001	3, 750, 659	2, 778, 868	3, 523, 396
Other industrial (including producer and water gas) net tons	4, 597, 894	8, 028, 791	7, 733, 382	6, 412, 672	6, 366, 497
Domestic do	8, 107, 518	3, 977, 328	3, 445, 309	2, 755, 840	2, 565, 176
Coke ovens, end of year:					
Slot-type ovens in existence	12, 718	14, 728	15, 139	15, 104	14, 982
Beehive ovens in existence	12, 194	13, 443	14, 078	13, 662	17, 708
Slot-type ovens under construction	259	572	350	562	706
Cost of coal charged, oven-coke plants, average per ton	$3. 74	$6. 78	$8. 13	$8. 52	$8. 67

For footnote, see end of table.

TABLE 1.—Salient statistics of the coke industry in the United States, 1937 and 1947–50—Continued

	1937	1947	1948	1949	1950
Average prices of coke:					
Spot price of Connellsville blast furnace, f. o. b. ovens	$4.29	$10.49	$13.44	$13.77	$14.06
Receipts per ton of oven coke sold (merchant sales):					
Blast furnace	$4.34	$10.95	$13.78	$14.09	$14.31
Foundry	$8.47	$14.79	$18.78	$19.72	$20.05
Other industrial (including water gas)	$6.08	$11.13	$13.45	$13.74	$14.10
Domestic	$6.53	$11.19	$13.17	$13.50	$13.60
Yield of coal-chemical materials per ton of coal charged:					
Tar, gallons	8.67	7.78	7.60	7.81	7.79
Ammonium sulfate or equivalent, pounds	21.84	19.66	19.52	20.08	19.89
Crude light oil, gallons	2.86	2.75	2.73	2.77	2.81
Surplus gas sold or used, M cubic feet	6.66	6.27	6.25	6.35	6.35
Average gross receipts for coal-chemical materials per ton of coke produced:					
Tar sold and used	$0.502	$0.605	$0.828	$0.722	$0.691
Ammonia and its compounds	$0.326	$0.423	$0.545	$0.558	$0.468
Crude light oil and its derivatives (including naphthalene)	$0.435	[2] $0.567	[2] $0.686	$0.673	$0.871
Surplus gas sold or used	$1.483	$1.678	$1.839	$2.015	$1.977
Total coal-chemical materials (including breeze)	$2.974	[2] $3.711	[2] $4.418	[2] $4.446	$4.508

[1] Unless otherwise stated statistics relating to coke throughout this chapter do not include breeze. (*See* definition of coke and breeze in Scope of Report section of this chapter).
[2] Revised figure.

TABLE 2.—Statistical summary of the coke industry in the United States in 1950

	Slot-type ovens	Beehive ovens	Total
Coke produced—			
At merchant plants:			
Net tons	12,346,822	(2)	(2)
Value	$190,570,598		
At furnace plants:[1]			
Net tons	54,543,796		
Value	$709,096,729		
Total:			
Net tons	66,890,618	5,827,420	72,718,038
Value	$899,667,327	$77,235,875	$976,903,202
Breeze produced:			
Net tons	5,172,758	90,712	5,263,470
Value	$18,543,877	$144,629	$18,688,506
Coal charged into ovens:			
Bituminous:			
Net tons	94,757,035	9,088,385	103,845,420
Value	$821,275,295	$51,769,434	$873,044,729
Average per ton	$8.67	$5.70	$8.41
Anthracite:			
Net tons	169,275		169,275
Value	$1,311,021		$1,311,021
Average per ton	$7.74		$7.74
Total:			
Net tons	94,926,310	9,088,385	104,014,695
Value	$822,586,316	$51,769,434	$874,355,750
Average per ton	$8.67	$5.70	$8.41
Average yield in percent of total coal charged:			
Coke	70.47	64.12	69.91
Breeze (at plants actually recovering)	5.45	3.32	5.39
Ovens:			
In existence Jan. 1	15,104	13,662	28,766
In existence Dec. 31	14,982	17,708	32,690
Dismantled during year	696	213	909
In course of construction Dec. 31	706	145	851
Annual coke capacity Dec. 31, net tons	72,488,200	11,571,500	84,059,700

For footnotes, see end of table.

TABLE 2.—Statistical summary of the coke industry in the United States in 1950—Continued

	Slot-type ovens	Beehive ovens	Total
Coke used by producer—			
In blast furnaces:			
Net tons	40,728,294	67,434	40,795,728
Value	$528,032,395	$795,163	$528,827,558
In foundries:			
Net tons	103,000		103,000
Value	$1,814,725		$1,814,725
To make producer gas:			
Net tons	755,849		755,849
Value	$9,299,239		$9,299,239
To make water gas:			
Net tons	1,501,979		1,501,979
Value	$18,410,591		$18,410,591
For other purposes:			
Net tons	321,864	2,732	324,596
Value	$4,141,065	$38,011	$4,179,076
Coke sold—			
To financially affiliated companies—			
For blast-furnace use:			
Net tons	11,342,443	1,838,547	13,180,990
Value	$147,999,186	$23,017,375	$171,016,561
For foundry use:			
Net tons	53,530		53,530
Value	$1,152,019		$1,152,019
For manufacture of water gas:			
Net tons	695,852		695,852
Value	$10,207,796		$10,207,796
For other purposes:			
Net tons	161,344	1,871	163,215
Value	$2,295,432	$26,654	$2,322,086
To other consumers—			
For blast-furnace use:			
Net tons	3,590,561	3,351,270	6,941,831
Value	$51,397,686	$45,431,674	$96,829,360
For foundry use:			
Net tons	3,182,688	184,178	3,366,866
Value	$63,825,214	$2,764,756	$66,589,970
For manufacture of water gas:			
Net tons	929,463	40,514	969,977
Value	$14,006,516	$566,175	$14,572,691
For other industrial use:			
Net tons	1,598,474	356,555	1,955,029
Value	$21,645,189	$4,852,642	$26,497,831
For domestic use:			
Net tons	2,546,164	19,012	2,565,176
Value	$34,633,619	$225,054	$34,858,673
Disposal of breeze:			
Used by producer—			
For steam raising:			
Net tons	3,353,357	5,408	3,358,765
Value	$11,286,949	$7,950	$11,294,899
To make producer or water gas:			
Net tons	113,158		113,158
Value	$638,737		$638,737
For other purposes:			
Net tons	797,435	11	797,446
Value	$2,560,127	$170	$2,560,297
Sold:			
Net tons	1,407,041	50,120	1,457,161
Value	$5,514,409	$105,404	$5,619,813
Average receipts per ton sold (merchant sales):			
Blast-furnace coke	$14.31	$13.56	$13.95
Foundry coke	$20.05	$15.01	$19.78
Water-gas coke	$15.07	$13.97	$15.02
Other industrial coke	$13.54	$13.61	$13.55
Domestic coke	$13.60	$11.84	$13.59
Breeze	$3.92	$2.10	$3.86
Producers' stocks on Jan. 1, 1951:			
Blast-furnace coke, net tons	756,199	17,068	773,267
Foundry coke, do	8,466	884	9,350
Domestic and other coke, do	327,997	100	328,097
Breeze, do	1,114,662	5,253	1,119,915
Exports, do	(2)	(2)	397,846
Imports, do	(2)	(2)	437,585
Apparent consumption, do	(2)	(2)	73,416,519

Fo footnote, see end of table.

TABLE 2.—Statistical summary of the coke industry in the United States in 1950—Continued

	Slot-type ovens	Beehive ovens	Total
Coal-chemical materials produced:			
Tar ---------- gallons	739, 868, 767	----------	739, 868, 767
Ammonium sulfate or equivalent ---------- pounds	1, 849, 127, 582	----------	1, 849, 127, 582
Gas ---------- M cubic feet	979, 592, 988	----------	979, 592, 988
Burned in coking process ---------- percent	36. 81	----------	36. 81
Surplus sold or used ---------- do	61. 54	----------	61. 54
Wasted ---------- do	1. 65	----------	1. 65
Crude light oil ---------- gallons	260, 856, 875	----------	260, 856, 875
Yield of coal-chemical materials per ton of coal:			
Tar ---------- gallons	7. 79	----------	7. 79
Ammonium sulfate or equivalent ---------- pounds	19. 89	----------	19. 89
Gas ---------- M cubic feet	10. 32	----------	10. 32
Crude light oil ---------- gallons	2. 81	----------	2. 81
Value of coal-chemical materials sold:			
Tar:			
Sold	$37, 558, 999	----------	$37, 558, 999
Used by producer	$8, 663, 204	----------	$8, 663, 204
Ammonia (sulfate and liquor)	$31, 322, 588	----------	$31, 322, 588
Gas (surplus)	$132, 247, 656	----------	$132, 247, 656
Crude light oil and derivatives	$53, 819, 463	----------	$53, 819, 463
Other coal-chemical materials [3]	$19, 421, 444	----------	$19, 421, 444
Total value of coke and breeze produced and coal-chemical materials sold [4]	$1, 201, 244, 558	$77, 380, 504	$1, 278, 625, 062

[1] Plants associated with iron blast furnaces. (*See* definition in section on Production by Furnace and Merchant Plants.)
[2] Not separately recorded.
[3] Naphthalene, tar derivatives, intermediate light oil, and miscellaneous coal-chemical materials.
[4] Includes value of tar used by producer.

TABLE 3.—Coke produced, value, number of ovens, coal charged, and average yield in the United States in 1950, by States

State	Oven coke						
	Plants	Ovens	Coal charged (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens: Total	Value of coke at ovens: Per ton
Alabama	7	1, 311	8, 221, 235	70. 95	5, 833, 142	$64, 331, 998	$11. 03
California	1	135	846, 247	60. 60	512, 790	(1)	(1)
Colorado	1	266	1, 181, 658	68. 12	804, 979	(1)	(1)
Illinois	8	900	5, 123, 840	70. 07	3, 590, 502	58, 141, 266	16. 19
Indiana	5	1, 801	11, 201, 317	73. 70	8, 255, 622	138, 880, 962	16. 82
Maryland	1	488	3, 300, 510	71. 72	2, 367, 233	(1)	(1)
Massachusetts	1	204	1, 193, 968	71. 63	855, 217	(1)	(1)
Michigan	4	584	3, 722, 106	73. 37	2, 730, 847	39, 191, 757	14. 35
Minnesota	3	273	1, 145, 826	72. 77	833, 861	13, 030, 429	15. 63
New Jersey	2	341	2, 061, 953	71. 83	1, 481, 030	(1)	(1)
New York	8	1, 136	7, 877, 787	68. 70	5, 412, 318	73, 459, 620	13. 57
Ohio	15	2, 310	14, 692, 413	70. 20	10, 313, 767	130, 016, 706	12. 61
Pennsylvania	13	3, 636	23, 641, 930	69. 08	16, 332, 998	201, 135, 604	12. 31
Tennessee	1	44	332, 439	73. 38	243, 950	(1)	(1)
Texas	2	125	961, 312	71. 40	686, 407	(1)	(1)
Utah	2	285	1, 779, 485	64. 10	1, 140, 737	(1)	(1)
West Virginia	5	644	4, 775, 747	70. 96	3, 388, 626	36, 457, 582	10. 76
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	6	499	2, 866, 537	73. 49	2, 106, 592	31, 876, 236	15. 13
Undistributed	------	------	------	------	------	113, 145, 167	13. 98
Total 1950	85	14, 982	94, 926, 310	70. 47	66, 890, 618	899, 667, 327	13. 45
At merchant plants	30	3, 036	17, 232, 762	71. 65	12, 346, 822	190, 570, 598	15. 43
At furnace plants	55	11, 946	77, 693, 548	70. 20	54, 543, 796	709, 096, 729	13. 00
Total 1949	85	15, 104	86, 054, 401	69. 98	60, 222, 481	798, 792, 069	13. 26

For footnote, see end of table.

TABLE 3.—Coke produced, value, number of ovens, coal charged, and average yield in the United States in 1950, by States—Continued

State	Beehive coke						Total	
	Ovens	Coal charged (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens		Coke produced (net tons)	Value of coke at ovens
					Total	Per ton		
Alabama							5,833,142	$64,331,998
California							512,790	(1)
Colorado							804,979	(1)
Illinois							3,590,502	58,141,266
Indiana							8,255,622	138,880,962
Maryland							2,367,233	(1)
Massachusetts							855,217	(1)
Michigan							2,730,847	39,191,757
Minnesota							833,861	13,030,429
New Jersey							1,481,030	(1)
New York							5,412,318	73,459,620
Ohio							10,313,767	130,016,706
Pennsylvania	14,954	8,061,544	64.42	5,193,191	$68,086,247	$13.11	21,526,189	269,221,851
Tennessee							243,950	(1)
Texas							686,407	(1)
Utah	797	155,301	54.61	84,808	(1)	(1)	1,225,545	(1)
Virginia	750	322,849	61.29	197,879	2,930,883	14.81	197,879	2,930,883
West Virginia	1,012	482,976	62,59	302,309	4,307,719	14.25	3,690,935	40,765,301
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	195	65,715	74.92	49,233	(1)	(1)	2,155,825	(1)
Undistributed					1,911,026	14.37		146,932,429
Total 1950	17,708	9,088,385	64.12	5,827,420	77,235,875	13.25	72,718,038	976,903,202
Total 1949	13,662	5,354,495	63.78	3,414,948	43,945,627	12.87	63,637,429	842,737,696

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

SCOPE OF REPORT

The statistics in this chapter, except where otherwise noted, are based on data voluntarily supplied to the Bureau of Mines by coke-plant operators in the United States. Except for minor variations, the characteristic form and manner of presentation of material developed in coke chapters for preceding years are followed in this report, carrying the Bureau's series on coke and coal-chemical materials through 1950. For convenience, most of the statistical tables herein include comparable data for three or four preceding years.

These statistics are confined to operation of high-temperature beehive and slot-type coke-oven plants. In order to present data in this chapter on the carbonization of coal by other processes, salient statistics for gas retorts are shown in table 4. Statistics on medium- and low-temperature carbonization have also been shown in recent years; but, as less than three producing companies reported production in 1950, data are withheld to prevent disclosure of individual operations. When compared with the production of coke and related products from slot-type and beehive-coke ovens, production from retorts and low-temperature ovens is not an important factor in supply and requirements.

Some coke is made by processes not included in this report, namely, from the refining of petroleum and crude tar. Preliminary data for 1950 indicate that the production of petroleum coke totaled 3,444,800 net tons, and output of pitch coke, as reported by the United States Tariff Commission, totaled 42,000 net tons.

The standard unit of measurement in the coke industry in the United States is the short or net ton of 2,000 pounds. Unless otherwise specified, it is the unit employed throughout this chapter.

The term "coke" as used throughout this report refers only to the larger sizes (usually one-half inch plus), from which the smaller sizes have been screened. The fine coke, which is separated by screening, is known in the industry as "breeze" and is the term used by the Bureau of Mines to designate this material.

RETORT COKE

TABLE 4.—Salient statistics of the coal-gas industry in the United States in 1950 [1]

	Horizontal retorts	Vertical retorts	Total
Coke produced:			
Net tons	58,331	116,091	174,422
Value	$726,814	$1,283,998	$2,010,812
Breeze produced net tons	6,317	18,538	24,855
Coal charged into retorts:			
Net tons	91,456	208,768	300,224
Value	$1,024,897	$2,401,940	$3,426,837
Average per ton	$11.21	$11.51	$11.41
Average yield in percent of coal charged:			
Coke	63.78	55.61	58.10
Breeze (at plants actually recovering)	7.60	10.38	9.50
Retorts:			
In existence Dec. 31	448	171	619
In operation Dec. 31	245	135	380
Annual coal capacity net tons	194,200	304,000	498,200
Coke used by producer:			
Net tons	39,056	95,898	134,954
Value	$486,420	$1,042,398	$1,528,818
Coke sold to other consumers:			
Net tons	22,330	38,185	60,515
Value	$278,116	$470,854	$748,970
Stocks on Jan. 1, 1951:			
Coke net tons	3,137	24,917	28,054
Breeze do	427	2,052	2,479
Coal-chemical materials:			
Tar:			
Production gallons	1,113,074	3,242,844	4,355,918
Sales do	1,206,347	2,321,109	3,527,456
Value of sales	$71,579	$147,158	$218,737
Stocks on Jan. 1, 1951 gallons	222,310	1,643,258	1,865,568
Per ton of coal charged do	12.17	15.53	14.51
Crude light oil: [2]			
Production do	41,101	115,842	156,943
Sales do	42,551	123,315	165,866
Value of sales	$3,778	$8,553	$12,331
Stocks on Jan. 1, 1951 gallons	5,750	12,053	17,803
Per ton of coal charged do	1.66	0.81	0.94

[1] Additional data in Bureau of Mines, Production of Coke and Coal Chemicals from Coal-Gas Retorts in 1950: Mineral Market Rept. 1991, July 1951.
[2] Includes drip and holder oil.

OVEN AND BEEHIVE COKE AND COKE BREEZE

TABLE 5.—Historical statistics of the coke industry in the United States, 1880 and 1890–1950

Year	Production (million net tons)			Percent of total production from slot-type ovens	Ovens in existence		Slot-type ovens under construction at end of year	Coal charged (million net tons)	Yield of coke from coal (percent)	Average value of coke per ton at plant	Total value at plant (million dollars)			
	Oven coke	Beehive coke	Total		Slot type	Beehive					Beehive coke	Oven coke	All coal-chemical materials [1]	Total coke and coal-chemical materials
1880	-------	3.3	3.3	------	--------	12,372	-------	5.2	63.7	$1.99	7	-----	-----	7
1890	-------	11.5	11.5	------	--------	37,158	-------	18.0	63.9	2.02	23	-----	-----	23
1891	-------	10.4	10.4	------	--------	40,057	-------	16.3	63.3	1.97	20	-----	-----	20
1892	-------	12.0	12.0	------	--------	42,002	-------	18.8	63.8	1.96	24	-----	-----	24
1893	0.01	9.5	9.5	0.1	12	44,189	-------	14.9	63.5	1.74	17	-----	(2)	(2)
1894	.02	9.2	9.2	.2	12	44,760	60	14.4	64.0	1.34	12	-----	(2)	(2)
1895	.02	13.3	13.3	.1	72	45,493	60	20.8	64.0	1.44	19		(2)	(2)
1896	.1	11.7	11.8	.7	160	46,784	120	18.7	63.1	1.84	22		(2)	(2)
1897	.3	13.0	13.3	2.0	280	47,388	240	20.9	63.6	1.66	22		(2)	(2)
1898	.3	15.7	16.0	1.8	520	47,863	500	25.2	63.6	1.59	26		(2)	(2)
1899	.9	18.8	19.7	4.6	1,020	48,583	65	30.2	65.1	1.76	35		(2)	(2)
1900	1.1	19.4	20.5	5.2	1,085	57,399	1,096	32.1	63.9	2.31	47		(2)	(2)
1901	1.2	20.6	21.8	5.4	1,165	62,786	1,533	34.2	63.7	2.04	44		-----	-----
1902	1.4	24.0	25.4	5.5	1,663	67,406	1,346	39.6	64.1	2.49	63		(2)	(2)
1903	1.9	23.4	25.3	7.4	1,956	77,378	1,335	39.4	64.1	2.63	66		(2)	(2)
1904	2.6	21.1	23.7	11.0	2,910	80,689	832	36.5	64.8	1.95	46		(2)	(2)
1905	3.4	28.8	32.2	10.7	3,103	84,405	417	49.5	65.1	2.25	72		(2)	(2)
1906	4.6	31.8	36.4	12.5	3,547	90,354	112	55.7	65.3	2.52	92		(2)	(2)
1907	5.6	35.2	40.8	13.8	3,684	95,996	330	61.9	65.8	2.74	90	22	8	120
1908	4.2	21.8	26.0	16.1	3,799	97,419	240	39.4	66.0	2.40	48	14	7	69
1909	6.2	33.1	39.3	15.9	3,989	99,993	949	59.4	66.2	2.29	70	20	8	98
1910	7.1	34.6	41.7	17.1	4,078	100,362	1,200	63.1	66.1	2.39	75	25	8	108
1911	7.9	27.7	35.6	22.1	4,624	99,255	698	53.3	66.7	2.37	57	27	10	94
1912	11.1	32.9	44.0	25.3	5,211	97,019	793	65.6	67.1	2.54	69	43	14	126
1913	12.7	33.6	46.3	27.5	5,688	96,962	504	69.2	66.9	2.78	80	49	17	146
1914	11.2	23.4	34.6	32.5	5,809	93,946	644	51.6	66.9	2.56	50	38	18	106
1915	14.1	27.5	41.6	33.8	6,268	93,110	1,191	61.8	67.2	2.54	57	49	30	136
1916	19.1	35.4	54.5	35.0	7,283	91,581	2,084	81.6	66.8	3.13	96	75	62	233
1917	22.4	33.2	55.6	40.4	7,869	88,027	2,260	83.8	66.4	5.36	159	139	68	366
1918	26.0	30.5	56.5	46.0	9,279	84,635	1,815	85.0	66.4	6.77	189	193	77	459
1919	25.1	19.1	44.2	56.9	10,379	82,560	877	65.6	67.4	5.85	98	160	68	326
1920	30.8	20.5	51.3	60.0	10,881	75,298	396	76.2	67.4	9.27	163	313	105	581
1921	19.8	5.5	25.3	78.1	11,142	66,014	85	37.2	68.0	5.84	30	118	68	216
1922	28.5	8.6	37.1	76.9	11,212	63,958	403	54.3	68.3	6.42	50	188	95	333
1923	37.6	19.4	57.0	66.0	11,156	62,349	629	84.4	67.5	6.56	116	257	131	504
1924	34.0	10.3	44.3	76.8	11,413	60,432	247	65.0	68.1	5.51	48	196	120	364
1925	39.9	11.4	51.3	77.9	11,290	57,587	429	74.5	68.8	5.12	52	211	143	406
1926	44.4	12.5	56.9	78.0	11,716	52,558	978	82.9	68.6	5.41	57	251	157	465
1927	43.9	7.2	51.1	85.9	12,475	49,795	289	74.4	68.6	5.13	30	232	160	422
1928	48.3	4.5	52.8	91.5	12,544	41,288	145	77.2	68.4	4.79	16	237	177	430
1929	53.4	6.5	59.9	89.2	12,649	30,082	408	86.8	69.0	4.66	23	256	192	471
1930	45.2	2.8	48.0	94.2	12,831	23,907	276	69.8	68.7	4.36	10	200	168	378
1931	32.4	1.1	33.5	96.6	13,108	21,588	-------	48.6	68.9	4.83	4	158	125	287
1932	21.1	.7	21.8	97.0	13,053	19,440	-------	31.9	68.3	4.79	2	103	88	193
1933	26.7	.9	27.6	96.7	13,053	16,857	-------	40.1	68.7	4.46	3	120	95	218
1934	30.8	1.0	31.8	96.8	12,963	14,206	-------	46.0	69.2	5.01	4	155	104	263
1935	34.2	.9	35.1	97.4	12,860	13,674	122	50.5	69.6	5.03	4	173	113	290
1936	44.6	1.7	46.3	96.3	12,849	13,012	305	65.9	70.2	5.02	7	226	136	369
1937	49.2	3.2	52.4	94.0	12,718	12,194	259	74.5	70.3	4.98	14	247	151	412
1938	31.7	.8	32.5	97.4	12,724	10,816	146	46.6	69.7	5.14	4	163	116	283
1939	42.9	1.4	44.3	96.7	12,732	10,934	-------	63.5	69.8	4.80	6	207	142	355
1940	54.0	3.1	57.1	94.6	12,734	15,150	492	81.4	70.1	4.80	14	260	168	442
1941	58.5	6.7	65.2	89.7	13,016	18,669	181	93.1	70.0	5.41	37	316	183	536
1942	62.3	8.3	70.6	88.3	13,303	16,295	1,327	100.8	70.0	6.03	47	378	204	629

For footnotes, see end of table.

TABLE 5.—Historical statistics of the coke industry in the United States, 1880 and 1890–1950—Continued

Year	Production (million net tons)			Percent of total production from slot-type ovens	Ovens in existence		Slot-type ovens under construction at end of year	Coal charged (million net tons)	Yield of coke from coal (percent)	Average value of coke per ton at plant	Total value at plant (million dollars)			
	Oven coke	Beehive coke	Total		Slot type	Beehive					Beehive coke	Oven coke	All coal-chemical materials[1]	Total coke and coal-chemical materials
1943	63.8	7.9	71.7	88.9	14,253	17,666	528	102.5	70.0	6.64	52	424	210	686
1944	67.0	7.0	74.0	90.6	14,580	16,318	180	105.3	70.3	7.13	49	479	208	736
1945	62.1	5.2	67.3	92.3	14,510	12,179	335	95.7	70.4	7.56	38	470	191	699
1946	53.9	4.6	58.5	92.2	14,494	12,864	824	83.5	70.0	8.32	37	450	173	660
1947	66.8	6.7	73.5	90.9	14,728	13,443	572	105.0	69.9	10.57	65	711	248	1,024
1948	68.3	6.6	74.9	91.2	15,139	14,078	350	107.6	69.6	12.40	79	849	302	1,230
1949	60.2	3.4	63.6	94.6	15,104	13,662	562	91.4	69.6	13.24	44	799	268	1,111
1950	66.9	5.8	72.7	92.0	14,982	17,708	706	94.9	69.9	13.43	77	900	302	1,279

[1] Value for tar up to and including 1917 represented that of tar "obtained and sold" which did not always include value of tar used by producer. Beginning with 1918, tar used by producer is specifically included. Value of breeze produced at oven-coke plants is included for those years for which it was reported, namely, 1916, 1917, and 1919–50. For other coal-chemical materials, only value of those sold is included. Value of breeze produced at beehive plants is not included, as it has usually been much less than a million dollars.
[2] No accurate data on value of the coal-chemical materials available.

MONTHLY AND WEEKLY PRODUCTION

Statistics on monthly production of coke in tables 6 to 8 are based upon reports received from producers. Weekly production of beehive coke in table 9 is estimated from reports of carloadings received from all coke-carrying railroads. The totals in these tables have been adjusted to the total ascertained by an annual canvass of the producers. Data on weekly production of beehive coke are published by the Bureau of Mines in the Weekly Anthracite and Beehive-Coke Report, and monthly data for both oven and beehive coke are summarized in the Monthly Coke Report. These publications are distributed free upon request to the Publications Distribution Section, Bureau of Mines, Washington 25, D. C.

TABLE 6.—Coke produced in the United States and average per day, 1937 and 1948–50, by months, in net tons [1]

Month	1937		1948		1949		1950	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
Oven coke:								
January	4,360,700	140,700	5,886,500	189,900	6,088,800	196,400	5,388,500	173,800
February	3,992,900	142,600	5,534,600	190,800	5,487,100	196,000	3,977,900	142,100
March	4,495,500	145,000	5,666,800	182,800	5,970,000	192,600	5,014,400	161,800
April	4,350,900	145,000	4,507,500	150,300	5,773,700	192,500	5,699,000	190,000
May	4,479,700	144,500	5,746,000	185,400	5,814,400	187,500	5,910,900	190,700
June	4,024,800	134,200	5,616,500	187,200	5,259,600	175,300	5,699,200	190,000
July	4,423,900	142,700	5,738,000	185,100	4,926,300	158,900	5,912,000	190,700
August	4,573,400	147,500	5,873,800	189,500	5,154,600	166,300	5,812,400	187,500
September	4,427,800	147,600	5,789,100	193,000	4,968,300	165,600	5,710,200	190,300
October	4,035,100	130,200	5,992,400	193,300	1,731,400	55,800	6,045,300	195,000
November	3,222,300	107,400	5,832,900	194,400	3,495,000	116,500	5,702,700	190,100
December	2,823,800	91,100	6,100,300	196,800	5,553,300	179,100	6,018,100	194,100
Total	49,210,800	134,800	68,284,400	186,600	60,222,500	165,000	66,890,600	183,200

For footnote, see end of table.

TABLE 6.—Coke produced in the United States and average per day, 1937 and 1948–50, by months, in net tons [1]—Continued

Month	1937		1948		1949		1950	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
Beehive coke:								
January	274,300	10,600	616,100	19,900	660,400	21,300	128,400	4,200
February	294,600	12,300	547,900	18,900	638,500	22,800	42,000	1,500
March	357,300	13,200	331,500	10,700	448,000	14,400	307,500	9,900
April	309,700	11,900	249,200	8,300	640,200	21,300	498,700	16,600
May	326,500	12,600	599,400	19,300	535,500	17,300	534,800	17,200
June	274,800	10,600	561,300	18,700	265,200	8,900	588,400	19,600
July	285,100	11,000	453,100	14,600	23,300	800	506,600	16,400
August	259,000	10,000	640,100	20,600	46,300	1,500	659,200	21,300
September	253,900	9,800	617,200	20,600	29,600	1,000	619,700	20,700
October	225,500	8,700	651,500	21,000	8,000	300	679,100	21,900
November	168,800	6,500	640,200	21,400	35,400	1,200	606,000	20,200
December	135,200	5,200	670,100	21,600	84,500	2,800	657,000	21,200
Total	3,164,700	10,200	6,577,600	17,900	3,414,900	9,300	5,827,400	16,000
Total:								
January	4,635,000	151,300	6,502,600	209,800	6,749,200	217,700	5,516,900	178,000
February	4,287,500	154,900	6,082,500	209,700	6,125,600	218,800	4,019,900	143,600
March	4,852,800	158,200	5,998,300	193,500	6,418,000	207,000	5,321,900	171,700
April	4,660,600	156,900	4,756,700	158,600	6,413,900	213,800	6,197,700	206,600
May	4,806,200	157,100	6,345,400	204,700	6,349,900	204,800	6,445,700	207,900
June	4,299,600	144,800	6,177,800	205,900	5,524,800	184,200	6,287,600	209,600
July	4,709,000	153,700	6,191,100	199,700	4,949,600	159,700	6,418,600	207,100
August	4,832,400	157,500	6,513,900	210,100	5,200,900	167,800	6,471,600	208,800
September	4,681,700	157,400	6,406,300	213,600	4,997,900	166,600	6,329,900	211,000
October	4,260,600	138,900	6,643,900	214,300	1,739,400	56,100	6,724,400	216,900
November	3,391,100	113,900	6,473,100	215,800	3,530,400	117,700	6,308,700	210,300
December	2,959,000	96,300	6,770,400	218,400	5,637,800	181,900	6,675,100	215,300
Grand total	52,375,500	145,000	74,862,000	204,500	63,637,400	174,300	72,718,000	199,200

[1] Before 1941 daily average production of beehive coke was calculated by subtracting Sundays and holidays in each month; 1942–50 daily average has been calculated by dividing total monthly production by total number of days in month.

TABLE 7.—Oven coke produced in the United States in 1950, by States and months, in net tons

[Based on reports from producers]

State	January	February	March	April	May	June	July
Alabama	487,300	251,800	390,200	503,500	516,700	498,700	523,500
California	41,400	27,000	23,500	43,000	46,600	45,400	46,500
Colorado	61,700	55,300	54,900	50,800	59,300	64,500	68,300
Illinois	288,200	222,300	254,900	300,900	317,900	309,100	319,700
Indiana	650,900	541,400	627,100	720,300	712,100	696,100	730,000
Maryland	176,400	145,300	166,900	192,600	223,000	209,400	209,300
Massachusetts	90,300	74,200	81,500	61,000	59,700	60,500	60,000
Michigan	237,700	189,400	201,400	241,000	254,200	237,800	249,900
Minnesota	57,100	50,500	59,000	56,000	64,900	71,700	75,900
New Jersey	122,000	90,700	109,300	127,700	131,500	128,500	132,200
New York	428,100	323,600	431,500	472,000	486,700	470,000	478,100
Ohio	834,900	573,500	798,200	891,200	929,500	875,300	888,600
Pennsylvania	1,335,500	998,600	1,235,300	1,395,200	1,445,000	1,393,700	1,451,400
Tennessee	18,900	16,100	20,100	19,900	20,600	19,900	20,800
Texas	45,700	38,400	47,500	56,900	59,300	59,900	64,500
Utah	66,800	51,000	74,600	104,800	109,100	104,500	110,100
West Virginia	270,200	187,900	271,300	288,000	288,600	277,600	296,500
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	175,400	140,900	167,200	174,200	186,200	176,600	186,700
Total	5,388,500	3,977,900	5,014,400	5,699,000	5,910,900	5,699,200	5,912,000
At merchant plants	1,070,700	809,200	953,400	1,034,100	1,068,600	1,031,200	1,064,500
At furnace plants	4,317,800	3,168,700	4,061,000	4,664,900	4,842,300	4,668,000	4,847,500

TABLE 7.—Oven coke produced in the United States in 1950, by States and months, in net tons—Continued

State	August	September	October	November	December	Total
Alabama	522,400	519,800	547,500	527,500	544,200	5,833,100
California	48,400	47,100	49,300	46,200	48,400	512,800
Colorado	72,500	74,300	81,700	79,800	81,900	805,000
Illinois	310,500	310,600	322,800	312,900	320,700	3,590,500
Indiana	671,500	718,200	752,800	723,900	711,300	8,255,600
Maryland	211,100	205,600	207,800	206,200	213,600	2,367,200
Massachusetts	58,900	58,700	64,400	88,600	97,400	855,200
Michigan	204,100	189,300	236,200	241,900	248,000	2,730,900
Minnesota	76,600	76,700	80,900	80,800	83,800	833,900
New Jersey	129,700	126,800	131,600	122,000	129,000	1,481,000
New York	475,800	450,700	471,700	441,700	482,400	5,412,300
Ohio	885,800	902,600	955,000	855,200	924,000	10,313,800
Pennsylvania	1,454,200	1,364,100	1,461,600	1,335,800	1,462,600	16,333,000
Tennessee	21,400	21,500	21,100	21,400	22,300	244,000
Texas	65,700	63,600	63,100	59,500	62,300	686,400
Utah	113,100	103,500	103,500	99,400	100,300	1,140,700
West Virginia	310,500	301,500	308,300	283,600	304,600	3,388,600
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	180,200	175,600	186,000	176,300	181,300	2,106,600
Total	5,812,400	5,710,200	6,045,300	5,702,700	6,018,100	66,890,600
At merchant plants	1,019,700	988,500	1,089,200	1,082,100	1,135,600	12,346,800
At furnace plants	4,792,700	4,721,700	4,956,100	4,620,600	4,882,500	54,543,800

TABLE 8.—Beehive coke produced in the United States in 1950, by States and months, in net tons

[Based on reports from producers]

State	January	February	March	April	May	June	July
Kentucky							300
Pennsylvania	97,200	36,600	270,700	451,800	485,500	540,700	469,500
Utah	3,700	400	5,900	7,800	8,200	8,100	6,300
Virginia	11,800	1,000	14,800	14,000	15,700	15,700	11,300
West Virginia	15,700	4,000	16,100	25,100	25,400	23,900	19,200
Total	128,400	42,000	307,500	498,700	534,800	588,400	506,600

State	August	September	October	November	December	Total
Kentucky	6,300	9,200	11,200	10,600	11,600	49,200
Pennsylvania	590,900	546,800	597,100	530,400	576,000	5,193,200
Utah	10,500	9,900	10,000	7,300	6,700	84,800
Virginia	20,800	22,500	25,000	21,800	23,500	197,900
West Virginia	30,700	31,300	35,800	35,900	39,200	302,300
Total	659,200	619,700	679,100	606,000	657,000	5,827,400

TABLE 9.—Beehive coke produced in the United States in 1950, by weeks

[Estimated from railroad shipments]

Week ended—	Net tons	Week ended—	Net tons	Week ended—	Net tons
Jan. 7	23,900	May 13	88,200	Sept. 16	158,600
Jan. 14	29,600	May 20	110,200	Sept. 23	131,500
Jan. 21	19,900	May 27	119,700	Sept. 30	159,900
Jan. 28	21,300	June 3	162,100	Oct. 7	150,000
Feb. 4	17,200	June 10	143,000	Oct. 14	147,900
Feb. 11	4,100	June 17	142,500	Oct. 21	160,500
Feb. 18	2,700	June 24	138,700	Oct. 28	163,800
Feb. 25	3,000	July 1	138,800	Nov. 4	158,600
Mar. 4	2,900	July 8	77,100	Nov. 11	159,800
Mar. 11	20,200	July 15	122,300	Nov. 18	155,100
Mar. 18	57,600	July 22	143,600	Nov. 25	137,900
Mar. 25	97,200	July 29	169,900	Dec. 2	82,600
Apr. 1	92,500	Aug. 5	142,500	Dec. 9	147,200
Apr. 8	102,200	Aug. 12	152,700	Dec. 16	164,900
Apr. 15	120,100	Aug. 19	146,000	Dec. 23	145,100
Apr. 22	126,000	Aug. 26	149,300	Dec. 30	147,300
Apr. 29	133,200	Sept. 2	157,500	Jan. 6, 1951	[1] 21,400
May 6	130,400	Sept. 9	127,200	Total	5,827,400

[1] 1 day only.

PRODUCTION BY FURNACE AND MERCHANT PLANTS

Production of oven coke by plants affiliated with iron blast furnaces, designated by the Bureau of Mines as "furnace" plants, and by all other plants, classified as "merchant" plants, is given in tables 10 and 11. This classification applies only to oven-coke plants and is maintained by the Bureau of Mines in the interest of those who wish to follow the coking activities of the two groups.

There has been a gradual increase during the past few years in the proportion of oven coke produced by the furnace group. This trend may be attributed to a number of economic factors that have had a definite influence on coke supply. Before World War II, iron and steel companies were reluctant to build slot-type ovens with coking capacity greater than 75 percent of their maximum blast-furnace coke requirements because of the fluctuation in steel demand. When peak steel-production rates were necessary, the steel industry could draw upon the merchant and beehive-coke ovens to meet their demands. However, the enormous demand for iron and steel products during and since World War II has increased metallurgical-coke requirements, and carbonizing capacity has been expanded at the furnace plants. Although demand for metallurgical coke has increased, markets for coke-oven gas and coke for household heating have diminished, and this has had a profound effect on the economic operation of some merchant plants. The use of natural gas and oil has increased rapidly in recent years and is currently spreading into many areas served by merchant-coke plants. These various factors have resulted in the closing of merchant-coke plants or their sale to iron and steel companies. The trend is clearly illustrated by table 10. Although there were 85 active plants in 1937, the same number as in 1950, 42 at that time were merchant plants that supplied nearly 27 percent of the total oven coke produced. By 1950 the number of merchant plants had declined to 30, and production was less than 19 percent of the total output.

TABLE 10.—Number and production of oven-coke plants connected with iron furnaces and of other oven-coke plants in the United States, 1913, 1918, 1937, and 1948–50

Year	Number of active plants		Coke produced (net tons)		Percent of production	
	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants
1913	20	16	9,277,832	3,436,868	73.0	27.0
1918	36	24	19,220,342	6,777,238	73.9	26.1
1937	43	42	36,134,209	13,076,539	73.4	26.6
1948	55	31	54,951,858	13,332,499	80.5	19.5
1949	55	31	48,109,559	12,112,922	79.9	20.1
1950	55	30	54,543,796	12,346,822	81.5	18.5

TABLE 11.—Monthly and average daily production of oven coke by plants connected with iron furnaces and by other plants in the United States, 1937 and 1949–50, in net tons

Month	1937		1949		1950	
	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants
Monthly production:						
January	3,241,600	1,119,100	4,933,900	1,154,900	4,317,800	1,070,700
February	2,996,500	996,400	4,444,300	1,042,800	3,168,700	809,200
March	3,355,000	1,140,500	4,843,900	1,126,100	4,061,000	953,400
April	3,310,300	1,040,600	4,701,300	1,072,400	4,664,900	1,034,100
May	3,375,600	1,104,100	4,732,700	1,081,700	4,842,300	1,068,600
June	2,917,500	1,107,300	4,250,600	1,009,000	4,668,000	1,031,200
July	3,316,100	1,107,800	3,943,300	983,000	4,847,500	1,064,500
August	3,469,300	1,104,100	4,166,300	988,300	4,792,700	1,019,700
September	3,334,700	1,093,100	3,993,900	974,400	4,721,700	988,500
October	2,910,500	1,124,600	908,400	823,000	4,956,100	1,089,200
November	2,142,700	1,079,600	2,689,000	806,000	4,620,600	1,082,100
December	1,764,400	1,059,400	4,502,000	1,051,300	4,882,500	1,135,600
Total	36,134,200	13,076,600	48,109,600	12,112,900	54,543,800	12,346,800
Average daily production:						
January	104,600	36,100	159,200	37,200	139,300	34,500
February	107,000	35,600	158,700	37,300	113,200	28,900
March	108,200	36,800	156,300	36,300	131,000	30,800
April	110,300	34,700	156,700	35,800	155,500	34,500
May	108,900	35,600	152,600	34,900	156,200	34,500
June	97,300	36,900	141,700	33,600	155,600	34,400
July	107,000	35,700	127,200	31,700	156,400	34,300
August	111,900	35,600	134,400	31,900	154,600	32,900
September	111,200	36,400	133,100	32,500	157,400	32,900
October	93,900	36,300	29,300	26,500	159,900	35,100
November	71,400	36,000	89,600	26,900	154,000	36,100
December	56,900	34,200	145,200	33,900	157,500	36,600
Average for year	99,000	35,800	131,800	33,200	149,400	33,800

PRODUCTION BY STATES AND DISTRICTS

There have been only minor changes since World War II in the distribution of coke production by States or geographic areas. During the period of rearmament and the war, a slight decentralization of iron and steel capacity necessarily caused a few minor changes in coke supply. The greatest change occurred in the Far Western States, where new slot-type ovens were constructed in California, Utah, and Colorado to supply coke requirements of new integrated blast furnaces.

Production of oven coke in this area (western district) increased from 1 percent of the national output in 1937 to nearly 4 percent in 1950. However, since World War II the only State in this area that has increased its coking capacity and production is California, where capacity increased by about one-third in 1950 and production increased 48 percent over 1949.

In quantity terms, the States that have increased oven-coke production most since 1937 are Ohio, Indiana, and Pennsylvania, with gains of 3,575,886, 2,788,561, and 2,631,736 tons, respectively. Comparison of 1950 production, by States, with either 1948 or 1949 figures would be meaningless because of the numerous interruptions in coking operations in 1949 and the first quarter of 1950.

There was no change in the order of coke production among the leading States in 1950. As in the past, Pennsylvania surpassed all other States, supplying about one-fourth of the total oven-coke output and nearly 90 percent of the beehive production. Ohio and Indiana followed, with 15 and 12 percent, respectively, of the oven-coke production, while Alabama and New York contributed about 8 percent each to the national total.

TABLE 12.—Coke produced in the United States, 1937 and 1947–50, by States, in net tons

State	1937	1947	1948	1949	1950
Oven coke:					
Alabama	4,259,771	5,869,738	6,015,460	5,161,397	5,833,142
California		332,244	296,749	346,552	512,790
Colorado	486,945	849,697	976,504	729,516	804,979
Illinois	2,998,663	3,805,374	3,675,284	3,195,645	3,590,502
Indiana	5,467,061	8,785,687	8,584,225	7,533,290	8,255,622
Maryland	1,513,651	1,975,201	2,147,787	2,039,957	2,367,233
Massachusetts	1,130,620	1,196,010	1,056,701	891,400	855,217
Michigan	2,283,518	2,818,941	2,849,601	2,484,409	2,730,847
Minnesota	704,631	897,739	846,246	781,943	833,861
New Jersey	1,015,073	1,432,210	1,410,941	1,345,094	1,481,030
New York	4,946,964	5,670,333	5,687,225	5,164,790	5,412,318
Ohio	6,737,881	10,069,237	10,562,486	8,911,140	10,313,767
Pennsylvania	13,701,262	16,474,893	16,649,689	14,768,809	16,332,998
Tennessee	89,451	241,925	251,428	213,378	243,950
Texas		263,006	644,225	497,019	686,407
Utah	149,659	975,772	1,058,501	901,829	1,140,737
Washington	14,656				
West Virginia	1,817,993	2,822,381	3,298,090	3,182,857	3,388,626
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	1,892,949	2,278,161	2,273,215	2,073,456	2,106,592
Total	49 210,748	66,758,549	68,284,357	60,222,481	66,890,618
Beehive coke:					
Colorado	64,222	21,489			
Kentucky		95,285	101,745	48,583	49,233
Pennsylvania	2,559,048	5,913,133	5,733,835	2,898,683	5,193,191
Tennessee	14,982				
Utah	6,657	67,693	188,586	132,762	84,808
Virginia	240,425	211,876	200,911	157,812	197,879
West Virginia	279,387	377,825	352,494	717,108	302,309
Total	3,164,721	6,687,301	6,577,571	3,414,948	5,827,420
Grand total	52,375,469	73,445,850	74,861,928	63,637,429	72,718,038

TABLE 13.—Production of oven coke, by geographic areas, 1937, 1940, and 1947–50, in net tons

Geographic areas	1937	1940	1947	1948	1949	1950
Connecticut, Massachusetts, and Rhode Island	1,717,558	1,779,306	1,890,973	1,746,550	1,543,356	1,541,161
Maryland, New Jersey, New York, and Pennsylvania	21,176,950	22,641,242	25,552,637	25,895,642	23,318,650	25,593,579
Ohio	6,737,881	7,897,929	10,069,237	10,562,486	8,911,140	10,313,767
Illinois, Indiana, and Missouri	8,730,680	9,660,017	12,868,508	12,539,204	10,948,153	12,074,629
Michigan, Minnesota, and Wisconsin	3,589,795	3,944,410	4,342,188	4,327,342	3,809,174	4,093,952
Alabama, Kentucky, Tennessee, and West Virginia	6,606,624	7,328,908	9,614,287	10,237,154	9,217,092	10,128,617
California, Colorado, Texas, Utah, and Washington	651,260	762,497	2,420,719	2,975,979	2,474,916	3,144,913
Total	49,210,748	54,014,309	66,758,549	68,284,357	60,222,481	66,890,618

TABLE 14.—Oven coke produced in the United States in 1950, by steel-producing districts [1]

District	Plants	Ovens	Coal charged (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens	
						Total	Per ton
Eastern	21	3,531	22,543,273	70.89	15,980,349	$218,838,094	$13.69
Pittsburgh-Youngstown	21	4,399	30,137,314	68.73	20,713,562	242,750,957	11.72
Cleveland-Detroit	10	1,668	10,472,062	71.97	7,536,968	101,775,324	13.50
Chicago	19	3,218	18,451,285	72.83	13,437,734	224,164,044	16.68
Southern	10	1,480	9,514,986	71.08	6,763,499	78,237,085	11.57
Western	4	686	3,807,390	64.57	2,458,506	33,901,823	13.79
Total	85	14,982	94,926,310	70.47	66,890,618	899,667,327	13.45

[1] As defined by American Iron and Steel Institute.

TABLE 15.—Coke produced in Pennsylvania in 1950, by districts

District	Plants	Ovens	Coal charged (net tons)	Yield of coke from coal (percent)	Coke produced (net tons)	Value of coke at ovens	
						Total	Per ton
Oven coke:							
Eastern [1]	5	796	4,739,142	72.41	3,431,693	$48,803,531	$14.22
Western [2]	8	2,840	18,902,788	68.25	12,901,305	152,332,073	11.81
Total	13	3,636	23,641,930	69.08	16,332,998	201,135,604	12.31
Beehive coke:							
Fayette County	63	10,610	5,533,410	63.85	3,533,293	45,457,506	12.87
Westmoreland County	38	3,182	1,769,977	65.70	1,162,925	16,003,091	13.76
Other counties [3]	7	1,162	758,157	65.55	496,973	6,625,650	13.33
Total	108	14,954	8,061,544	64.42	5,193,191	68,086,247	13.11
Grand total	121	18,590	31,703,474	67.90	21,526,189	269,221,851	12.51

[1] Includes plants at Bethlehem, Chester, Philadelphia, Steelton, and Swedeland.
[2] Includes plants at Aliquippa, Clairton, Erie, Johnstown, Midland, Monessen, Neville Island, and Pittsburgh.
[3] Beaver, Bedford, Greene, and Indiana.

COKE BREEZE

TABLE 16.—Coke breeze recovered at coke plants in the United States in 1950, by States

State	Yield per ton of coal [1] (percent)	Produced		Used by producer—				Sold		Wasted (net tons)	On hand Dec. 31 (net tons)
				For steam raising		For other purposes (including water gas)					
		Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value		
Oven coke:											
Alabama	4.17	342,803	$2,014,746	92,050	$487,860	61,502	$343,763	204,267	$1,278,244	----------	19,194
California	5.91	50,034	(2)	----------	----------	36,384	(2)	20,191	(2)	----------	29,696
Colorado	5.73	67,740	(2)	----------	----------	42,371	(2)	24,139	(2)	----------	4,973
Illinois	6.23	319,469	957,298	130,403	337,411	19,579	71,652	150,469	501,845	----------	132,740
Indiana	6.06	678,802	1,867,002	423,856	1,117,827	132,175	292,719	121,016	483,443	105	138,545
Maryland	6.09	201,042	(2)	200,336	(2)	26,929	(2)	59,680	(2)	----------	162,754
Massachusetts	7.43	88,696	(2)	95,489	(2)	----------	----------	11,947	(2)	----------	2,666
Michigan	5.40	201,137	857,518	136,074	557,416	32,238	131,187	34,019	176,668	----------	16,340
Minnesota	5.20	59,616	248,386	43,731	154,131	8,890	(2)	34,248	156,121	----------	16,615
New Jersey	5.21	107,506	(2)	107,159	(2)	----------	----------	6	(2)	----------	11,032
New York	7.03	553,902	2,803,708	316,801	1,582,987	144,830	771,263	38,018	178,456	----------	106,459
Ohio	5.60	822,825	2,719,696	444,737	1,606,519	183,029	554,953	242,667	736,835	1,795	86,958
Pennsylvania	4.70	1,111,755	3,028,386	1,083,408	2,894,435	96,852	249,259	290,411	725,064	----------	294,161
Tennessee	2.84	9,449	(2)	----------	----------	3,480	(2)	7,726	(2)	----------	1,802
Texas	6.06	58,222	(2)	----------	----------	8,565	(2)	38,870	(2)	----------	539
Utah	8.69	154,684	(2)	24,381	(2)	65,044	(2)	84,840	(2)	----------	9,199
West Virginia	4.13	197,440	476,867	118,282	284,950	48,725	119,164	25,215	58,780	----------	68,609
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	5.15	147,636	512,897	136,650	439,805	----------	----------	19,312	101,236	----------	12,380
Undistributed	----------	----------	3,057,373	----------	1,823,608	----------	664,904	----------	1,117,717	----------	----------
Total 1950	5.45	5,172,758	18,543,877	3,353,357	11,286,949	910,593	3,198,864	1,407,041	5,514,409	1,900	1,114,662
At merchant plants	5.39	929,599	4,351,975	741,292	3,167,375	94,847	559,030	158,328	851,944	1,755	89,861
At furnace plants	5.46	4,243,159	14,191,902	2,612,065	8,119,574	815,746	2,639,834	1,248,713	4,662,465	145	1,024,801
Total 1949	5.76	4,929,086	16,935,002	3,199,101	10,550,793	838,744	2,914,659	1,055,459	4,106,014	19,982	1,433,289
Beehive coke:											
Pennsylvania	3.55	78,148	99,522	5,408	7,950	----------	----------	40,363	66,087	31,635	5,253
Utah	1.40	1,208	(2)	----------	----------	----------	----------	1,208	(2)	----------	----------
Virginia	1.11	1,957	(2)	----------	----------	11	(3)	1,946	(2)	----------	----------
West Virginia	4.66	9,399	18,917	----------	----------	----------	----------	6,603	13,297	2,796	----------
Undistributed	----------	----------	26,190	----------	----------	----------	----------	----------	26,020	----------	----------
Total 1950	3.32	90,712	144,629	5,408	7,950	11	(3)	50,120	105,404	[4] 34,431	5,253

[1] Computed by dividing production of breeze by coal charged at plants actually recovering breeze.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.
[3] Figure withheld to avoid disclosure of individual company operations.
[4] As reported; quantity produced but not used was undoubtedly greater. (*See* Mineral Resources of the United States, 1922, pt. II, pp. 726–727.)

NUMBER AND TYPE OF OVENS

Slot-Type Coke Ovens.—Construction of new slot-type coke ovens in the United States in 1950 was limited by the availability of refractories (coke-oven shapes) and other essential building materials, and for the second consecutive year the number of ovens completed dropped below the number abandoned or dismantled. The extremely high rate of obsolescence or oven failures during the past several years will probably continue because of the large number of ovens in existence at the close of 1950 that were over 20 years old. This is not to be construed that 20 years is the maximum life expectancy of coke ovens, as a number of much older batteries are still in good operating condition. Also, the length of efficient service that may be obtained from a new coke-oven battery depends on the operating conditions at each plant and upon the decision of the owners as to when maintenance and repairs on old batteries become excessive. However, coke-oven operators and builders agree that, with few exceptions, ovens older than 20 years become increasingly difficult to maintain in good operating condition.

The large number of old ovens and the rapidly expanding requirements for metallurgical coke caused by critical international conditions have intensified the efforts of Government and industry to increase slot-type coke capacity commensurate with blast-furnace expansion. Programed steel requirements for essential defense and civilian purposes indicated that 1950 coke capacity would have to be expanded at least by 14 percent in the following 2 years. This meant that construction would have to be accelerated rapidly, as slot-type ovens take considerable time to construct and put into production. A new battery of coke ovens requires 8 to 14 months for completion, the number that can be completed in a year depending on such factors as the availability of building materials, labor, and weather conditions. At the close of 1950, 706 new ovens were under construction, and contracts were pending on a number of additional batteries. Although some of the new construction was to consist of replacements for old ovens, it was believed that new oven completions in 1951 would exceed those taken out of production.

Beehive Ovens.—At the conclusion of World War II it was believed that the end of carbonizing coal in beehive ovens was in sight and that this type of carbonizing equipment would soon pass into oblivion. Events in 1950, however, proved that these forecasts were wrong, and more beehive ovens were pressed into service than in any other comparable period since 1942.

Although the number and coke capacity of beehive ovens have been ascertained annually for many years by the Bureau of Mines, no attempt was made until recently to separate the operable coking capacity from the total in existence. In table 20, however, showing beehive-oven capacity at the end of 1950, this distinction is made. It is to be noted that about 14 percent of the total beehive capacity reported in existence comprises old ovens that are not in operating condition and are incapable of producing coke without extensive repairs or rebuilding. Therefore, for practical purposes, only service-able ovens should be considered. The heavy demand for coke in 1950 is reflected by the steady increase in the number of active ovens (table 21); in other words, 94 percent of the ovens in operating condition at the end of the year produced coke in December.

TABLE 17.—Slot-type coke ovens completed and abandoned in the United States in 1950 and total number in existence at end of year, by States

State	Plants in existence Dec. 31	Ovens						
		In existence Dec. 31		New		Abandoned during year	Under construction Dec. 31	
		Number	Annual coke capacity (net tons)	Number	Annual coke capacity (net tons)		Number	Annual coke capacity (net tons)
Alabama	7	1,311	6,471,000				59	327,000
California	1	135	566,000					
Colorado	1	266	1,000,000					
Connecticut	1	70	(1)					
Illinois	8	900	3,852,100					
Indiana	5	1,801	8,940,300	65	337,000	135	154	764,000
Kentucky	1	120	(1)					
Maryland	1	488	2,647,000	65	410,000	60	63	281,000
Massachusetts	1	204	1,260,000	67	405,000	67		
Michigan	4	584	3,290,500	16	123,000			
Minnesota	3	273	993,700	77	339,400			
Missouri	1	64	(1)					
New Jersey	2	341	1,552,000					
New York	8	1,136	6,056,400			6	36	178,000
Ohio	15	2,310	11,368,500	105	618,000	43		
Pennsylvania	13	3,636	16,930,700	179	853,900	273	310	1,966,600
Rhode Island	1	65	(1)					
Tennessee	1	44	252,000					
Texas	2	125	670,500					
Utah	2	285	1,094,600			23	23	86,000
West Virginia	5	644	3,393,200			74	61	390,000
Wisconsin	1	180	(1)			15		
Undistributed			2,149,700					
Total 1950	84	14,982	72,488,200	574	3,086,300	696	706	3,992,600
At merchant plants	29	3,036	13,959,300	67	405,000	88	29	154,000
At furnace plants	55	11,946	58,528,900	507	2,681,300	608	677	3,838,600
Total 1949	85	15,104	73,710,100	469	2,275,300	504	562	3,275,000

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 18.—Age of slot-type ovens in the United States on Dec. 31, 1950[1]

Age	Merchant plants		Furnace plants		Total			
	Number of ovens	Annual coke capacity (net tons)	Number of ovens	Annual coke capacity (net tons)	Number of ovens	Percent of total	Annual coke capacity (net tons)	Percent of total
Under 5 years	249	1,415,900	1,999	10,570,500	2,248	15.0	11,986,400	16.5
From 5 to 10 years	297	1,460,200	2,009	10,880,700	2,306	15.4	12,340,900	17.0
From 10 to 15 years	308	1,544,600	1,560	9,026,200	1,868	12.5	10,570,800	14.6
From 15 to 20 years	97	315,300	513	2,386,300	610	4.1	2,701,600	3.7
From 20 to 25 years	619	3,407,300	642	3,689,000	1,261	8.4	7,096,300	9.8
25 years and over	1,466	5,816,000	5,223	21,976,200	6,689	44.6	27,792,200	38.4
Total	3,036	13,959,300	11,946	58,528,900	14,982	100.0	72,488,200	100.0

[1] Age dates from first entry into operation or from last date of rebuilding.

TABLE 19.—Number of slot-type ovens in the United States on Dec. 31, 1950, by kinds and States

State	Koppers	Koppers-Becker	Semet-Solvay	Wilputte	All others [1]	Total
Alabama	517	549	180	65		1,311
California		135				135
Colorado	120	146				266
Connecticut		70				70
Illinois	371	246	120	163		900
Indiana	340	739	161	561		1,801
Kentucky			120			120
Maryland	240	248				488
Massachusetts		149		55		204
Michigan		222	362			584
Minnesota	155	98		20		273
Missouri	56				8	64
New Jersey	165	176				341
New York	150	608	180	152	46	1,136
Ohio	1,241	454	301	314		2,310
Pennsylvania	1,635	1,465	88	328	120	3,636
Rhode Island	40	25				65
Tennessee			24	20		44
Texas		125				125
Utah		285				285
West Virginia	154	345		145		644
Wisconsin	100		80			180
Total	5,284	6,085	1,616	1,823	174	14,982
At merchant plants	677	1,172	730	403	54	3,036
At furnace plants	4,607	4,913	886	1,420	120	11,946

[1] Comprises 46 American Foundation, 120 Cambria, and 8 Piette.

TABLE 20.—Beehive-coke ovens reconstructed and abandoned in the United States in 1950 and total number in existence at end of year, by States

State	Plants in existence Dec. 31	Ovens								
		Total available Dec. 31		In operating condition Dec. 31		Not in operating condition Dec. 31		Rebuilt or repaired	Abandoned or dismantled during year	In course of reconstruction Dec. 31
		Number	Annual coke capacity (net tons)	Number	Annual coke capacity (net tons)	Number	Annual coke capacity (net tons)			
Kentucky	1	195	117,000	191	114,600	4	2,400			1
Pennsylvania	108	14,954	10,246,600	12,432	8,660,800	2,522	1,585,800	2,020	195	138
Utah	2	797	285,000	783	280,400	14	4,600			
Virginia	5	750	377,000	700	351,300	50	25,700	18	18	6
West Virginia	9	1,012	545,900	956	513,200	56	32,700			
Total	125	17,708	11,571,500	15,062	9,920,300	2,646	1,651,200	2,038	213	145

TABLE 21.—Average number of beehive ovens active in the United States in 1950, by months

Month	Number	Month	Number	Month	Number
January	4,627	May	11,191	September	13,496
February	2,835	June	11,717	October	13,952
March	8,661	July	12,553	November	14,176
April	10,920	August	12,953	December	14,227

CAPACITY OF OVEN-COKE PLANTS

The potential annual coke capacity of oven-coke plants declined for the second consecutive year in 1950, dropping 3 percent from the record capacity of 1948. The basis for calculating the potential annual coke capacity of a plant is the minimum coking time necessary to produce a coke with qualities suitable for its intended use. For this reason, the potential capacity of a plant is subject to change from year to year, depending on the age and condition of ovens, character and quality of coal charged, type of coke required, and other related economic conditions. The potential capacity reported to the Bureau of Mines by the coke-producing companies may differ, therefore, from the rated capacity estimated by the coke-oven builders at the time of construction. It is believed, however, that the potential capacity shown in table 22 is a good measure of the practical operating capacity.

The decline of 2 percent in coke capacity in 1950 was due largely to the number of ovens taken out of production for rebuilding. At the end of the year, construction of replacement ovens, as well as additional batteries, was proceeding as rapidly as weather and availability of building materials permitted, and over 3,900,000 tons of capacity were under construction.

The rate of coke production at oven-coke plants in October 1950 reached the highest point since April 1944. However, the average for the year, although well above 1949, was 2 points below 1948 and nearly 7 points below the record established in 1942. The performance in 1950 would have been better if all plants had operated at their normal rates in the first quarter. In this quarter, however, the

TABLE 22.—Potential maximum annual coke capacity of all oven-coke plants in existence in the United States, 1937 and 1946–50

Year	Plants	Ovens	Potential maximum annual coke capacity (net tons)	Percent of change from 1937
1937	87	12,718	62,727,100	----------
1946	87	14,494	71,112,600	+13.4
1947	86	14,728	72,549,100	+15.7
1948	86	15,139	74,499,900	+18.8
1949	85	15,104	73,710,100	+17.5
1950	84	14,982	72,488,200	+15.6

TABLE 23.—Relationship of production to potential maximum capacity [1] at oven-coke plants in the United States, 1937 and 1947–50, by months, in percent

Month	1937	1947	1948	1949	1950	Month	1937	1947	1948	1949	1950
January	83.0	91.0	94.8	95.2	85.6	August	86.0	90.5	93.1	80.3	91.8
February	83.5	92.0	94.7	95.0	70.0	September	86.1	89.3	94.9	79.8	94.0
March	84.9	91.7	90.9	93.3	79.3	October	76.0	91.3	93.9	26.9	96.2
April	84.9	90.1	74.6	93.3	92.9	November	62.8	91.9	94.0	55.8	93.8
May	84.6	89.6	92.0	90.8	92.7	December	53.1	92.6	95.0	86.2	95.8
June	78.6	89.1	93.3	84.9	92.4						
July	83.2	86.9	92.2	77.0	93.7	Year	78.8	90.5	92.0	79.7	90.0

[1] Capacity of all ovens in existence, whether active or idle, based upon maximum daily capacity times days in month.

uncertainty of coal supplies caused oven-coke plants to curtail operations slightly, and the industry produced only 78.6 percent of capacity. Operations were accelerated rapidly after a new management-labor contract for the bituminous-coal industry was signed on March 6, and a relatively high rate of coke production was maintained for the balance of the year.

QUANTITY AND COST OF COAL CHARGED

Coke ovens (slot-type and beehive) are the largest consumers of bituminous coal in the United States, using over one-fifth of the annual output in 1950. Although natural gas and oil have displaced some bituminous coal on railroads, at industrial plants, and for household heating, there is no substitute for bituminous coal in the making of metallurgical coke, and coke ovens should continue to rank high for many years in bituminous-coal utilization. Although consumption of bituminous coal in coke ovens in 1950 increased 14 percent over the 1949 figure, it fell nearly 3½ million tons short of the record established in 1948. The 3-day workweek and complete stoppages for various periods during the first quarter of 1950 in the bituminous-coal industry adversely affected coke-oven operations in that quarter and drastically reduced the quantity of coal carbonized. In fact, many beehive operations closed during the last half of 1949 when the 3-day workweek started and did not resume production until the middle of March 1950. Beginning in the second quarter, consumption of bituminous coal increased substantially and remained at a relatively uniform rate for the balance of the year. Under normal conditions, the monthly consumption of bituminous coal is quite uniform because of the continuous nature of the coking process. The practice of mixing or blending a small percentage of anthracite fines, which started during World War II, was continued at 10 plants in 1950.

In manufacturing coke and coal chemicals, coal is the chief item of expense, usually approximating about 80 percent of the total manufacturing costs. For this reason coal costs have a definite influence on coke-oven operations and are of paramount importance to the coke-plant operators. Although the average value per ton, f. o. b. mines, of bituminous coal in the United States declined from \$4.88 per net ton in 1949 to \$4.85 per ton in 1950, it is significant that the average cost of coal for both slot-type and beehive ovens increased in this period. The average cost of coal at oven-coke plants in 1950, the highest on record, increased \$0.15 per ton or 2 percent over 1949 and was 136 percent higher than the 1940 figure. A large part of the coal used at oven-coke plants is long-haul coal, which necessarily increases the cost at ovens. For this reason, Rhode Island, California, and Massachusetts had the highest average costs, while West Virginia, which obtains coal from nearby fields, had the lowest.

Although the average cost of coal at beehive ovens in 1950 was the highest on record, because of their proximity to the mines, it was

232294—53——28

TABLE 24.—Coal consumed in coke ovens in the United States, 1937 and 1949–50, by months, in net tons

Month	1937			1949			1950		
	Coke oven	Beehive	Total	Coke oven [1]	Beehive	Total	Coke oven [2]	Beehive	Total
Jan	6,198,700	426,600	6,625,300	8,658,200	1,033,400	9,691,600	7,710,300	204,200	7,914,500
Feb	5,679,900	458,500	6,138,400	7,839,600	997,100	8,836,700	5,714,500	67,800	5,782,300
Mar	6,387,000	556,800	6,943,800	8,518,600	707,300	9,225,900	7,165,000	486,300	7,651,300
Apr	6,183,800	480,800	6,664,600	8,261,100	997,900	9,259,000	8,115,400	783,400	8,898,800
May	6,368,500	509.700	6,878,200	8,303,900	826,400	9,130,300	8,396,800	839,200	9,236,000
June	5,729,200	430,500	6,159,700	7,524,900	408,300	7,933,200	8,093,400	911,600	9,005,000
July	6,217,200	441,700	6,658,900	7,029,700	40,900	7,070,600	8,386,500	795,500	9,182,000
Aug	6,425,800	401,100	6,826,900	7,379,200	78,400	7,457,600	8,227,500	1,018,500	9,246,000
Sept	6,220,700	392,800	6,613,500	7,054,100	48,400	7,102,500	8,084,500	961,100	9,045,600
Oct	5.664,800	351,600	6,016,400	2,474,000	15,300	2,489,300	8,506,600	1,055,400	9,562,000
Nov	4,527,000	264,000	4,791,000	5,052,400	61,200	5,113,600	8,028,600	936,900	8,965,500
Dec	3,972,800	212,700	4,185,500	7,958,700	139,900	8,098,600	8,497,200	1,028,500	9,525,700
Total	69,575,400	4,926,800	74,502,200	86,054,400	5,354,500	91,408,900	94,926,300	9,088,400	104,014,700

[1] Includes 172,800 tons of anthracite fines.
[2] Includes 169,300 tons of anthracite fines.

TABLE 25.—Quantity and value at ovens of coal used in manufacturing coke in the United States in 1950, by States

State	Coal used (net tons)	Cost of coal		Coal per ton of coke	
		Total	Per ton	Net tons	Cost
Oven coke:					
Alabama	8,221,235	$57,248,063	$6.96	1.41	$9.81
California	846,247	(1)	(1)	1.65	(1)
Colorado	1,181,658	(1)	(1)	1.47	(1)
Illinois	5,123,840	51,117,017	9.98	1.43	14.27
Indiana	11,201,317	110,579,789	9.87	1.36	13.42
Maryland	3,300,510	(1)	(1)	1.39	(1)
Massachusetts	1,193,968	(1)	(1)	1.40	(1)
Michigan	3,722,106	33,547,982	9.01	1.36	12.25
Minnesota	1,145,826	11,696,577	10.21	1.37	13.99
New Jersey	2,061,953	(1)	(1)	1.39	(1)
New York	7,877,787	77,598,775	9.85	1.46	14.38
Ohio	14,692,413	125,053,032	8.51	1.42	12.08
Pennsylvania	23,641,930	184,911,424	7.82	1.45	11.34
Tennessee	332,439	(1)	(1)	1.36	(1)
Texas	961,312	(1)	(1)	1.40	(1)
Utah	1,779,485	(1)	(1)	1.56	(1)
West Virginia	4,775,747	32,086,032	6.72	1.41	9.48
Connecticut. Kentucky, Missouri, Rhode Island, and Wisconsin	2,866,537	27,202,322	9.49	1.36	12.91
Undistributed		111,545,303	9.57	1.44	13.78
Total	94,926,310	822,586,316	8.67	1.42	12.31
At merchant plants	17,232,762	161,891,626	9.39	1.40	13.15
At furnace plants	77,693,548	660,694,690	8.50	1.42	12.07
Beehive coke:					
Kentucky	65,715	(1)	(1)	1.33	(1)
Pennsylvania	8,061,544	46,431,588	5.76	1.55	8.93
Utah	155,301	(1)	(1)	1.83	(1)
Virginia	322,849	1,776,511	5.50	1.63	8.97
West Virginia	482,976	2,560,236	5.30	1.60	8.48
Undistributed		1,001,099	4.53	1.65	7.47
Total	9,088,385	51,769.434	5.70	1.56	8.89

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

lower than at oven-coke plants. However, in recent years many of the beehive operators have been burdened with an additional expense in trucking part, sometimes all, of their coal requirements. In the Connellsville region of Pennsylvania, coal was trucked as far as 40 miles to beehive plants in 1950. Transportation costs alone on such hauls approximated $2 per ton. This large increment in total coal costs for many plants had some influence on the cost of coal for the beehive industry. The average cost of $5.70 per ton was 5 percent above the 1949 average and 186 percent higher than the 1940 figure. Kentucky and Utah operators had the lowest cost, while Pennsylvania had the highest because of trucking charges.

TABLE 26.—Average cost per net ton of coal carbonized at oven-coke plants in the United States, 1937 and 1946–50, by States

State	1937	1946	1947	1948	1949	1950
Alabama	$2.33	$4.96	$5.57	$6.48	$6.81	$6.96
Illinois	4.62	6.70	8.00	9.38	9.75	9.98
Indiana	4.71	6.75	8.01	9.35	9.71	9.87
Michigan	4.16	5.97	6.79	8.26	8.99	9.01
Minnesota	5.24	6.86	8.33	9.90	10.10	10.21
New York	4.55	6.71	7.76	9.48	9.83	9.85
Ohio	3.76	5.72	6.76	8.11	8.42	8.51
Pennsylvania	2.98	4.79	5.87	7.22	7.64	7.82
West Virginia	2.54	3.84	4.72	6.14	6.37	6.72
Other States [1]	4.53	6.51	7.46	8.88	9.42	9.57
United States average	3.74	5.77	6.78	8.13	8.52	8.67
Cost of coal per ton of coke	5.27	8.17	9.60	11.58	12.18	12.30

[1] California, Colorado, Connecticut, Kentucky, Maryland, Massachusetts, Missouri, New Jersey, Rhode Island, Tennessee, Texas, Utah, and Wisconsin.

TABLE 27.—Cost of coal and value of products per net ton of coke produced in the United States, 1918, 1929, 1937, and 1945–50

Year	Oven coke				Beehive coke	
	Cost of coal per ton of coke	Value per ton of coke produced			Cost of coal per ton of coke	Value per ton
		Coke	Coal-chemical materials [1]	Total		
1918	$6.00	$7.42	$3.08	$10.50	$3.65	$6.21
1929	5.04	4.80	3.56	8.36	2.85	3.49
1937	5.27	5.03	2.97	8.00	3.14	4.31
1945	7.45	7.57	3.07	10.64	5.48	7.36
1946	8.17	8.35	3.20	11.55	5.63	8.03
1947	9.60	10.65	3.71	14.36	6.94	9.77
1948	11.58	12.43	4.42	16.85	8.02	12.10
1949	12.18	13.26	4.45	17.71	8.50	12.87
1950	12.30	13.45	4.51	17.96	8.88	13.25

[1] Includes value of breeze produced.

PREPARATION AND SOURCE OF COAL

The coke industry, probably more than any other, maintains exacting specifications and standards for the coal required in manufacturing high-quality coke. The reason for this is obvious, as coke quality depends to a much greater degree upon the character and quality of coal carbonized than upon oven design or carbonizing practice. The steady increase in the proportion of cleaned coal carbonized in recent years is due largely to diminishing reserves of the better-quality coking coals and also to rapid increase in coal-mine mechanization. Mechanical mining and loading of coal, although increasing productivity with a consequent reduction in mining costs, often result in more refuse in the run-of-mine coal, necessitating extensive cleaning in some areas. All coal mined and used for the manufacture of coke in Alabama and Colorado was washed, and most of Oklahoma's and about half of Pennsylvania's were also washed before being carbonized. The quantity of washed coal carbonized in slot-type ovens in 1950, according to reports submitted by coke-plant operators, was 40 percent of the total tonnage of bituminous coal carbonized compared with 38 percent in 1949 and 28 percent in 1946. The proportion of washed coal charged into beehive ovens is less than in slot-type ovens and was 18 percent in 1950. Most of the cleaning or washing is done by the coal-mine operators at the mines. In 1950 bituminous coal cleaned at the mines was used by 45 oven- and 9 beehive-coke plants and comprised 79 percent of the washed coal carbonized. The remainder (8,336,228 tons) was washed at eight coke plants which have cleaning facilities.

TABLE 28.—Washed and unwashed coal used in manufacturing coke in the United States in 1950, by States in which used, in net tons

State	Slot-type ovens				Beehive ovens		
	Bituminous		Anthracite	Total	Bituminous		
	Washed	Unwashed			Washed	Unwashed	Total
Alabama	7,943,184	257,253	20,798	8,221,235			
California	760,970	85,277		846,247			
Colorado	1,181,658			1,181,658			
Illinois	2,420,626	2,682,755	20,459	5,123,840			
Indiana	3,499,638	7,701,679		11,201,317			
Maryland		3,300,510		3,300,510			
Massachusetts		1,190,873	3,095	1,193,968			
Michigan	250,460	3,471,646		3,722,106			
Minnesota	260,463	873,927	11,436	1,145,826			
New Jersey		2,061,953		2,061,953			
New York	870,492	6,982,695	24,600	7,877,787			
Ohio	6,475,807	8,213,163	3,443	14,692,413			
Pennsylvania	10,902,989	12,692,689	46,252	23,641,930	1,441,535	6,620,009	8,061,544
Tennessee		332,439		332,439			
Texas	807,002	154,310		961,312			
Utah		1,779,485		1,779,485	155,301		155,301
Virginia						322,849	322,849
West Virginia	1,626,701	3,135,712	13,334	4,775,747		482,976	482,976
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	792,336	2,048,343	25,858	2,866,537		65,715	65,715
Total	37,792,326	56,964,709	169,275	94,926,310	1,596,836	7,491,549	9,088,385
At merchant plants	2,667,322	14,483,794	81,646	17,232,762			
At furnace plants	35,125,004	42,480,915	87,629	77,693,548			

TABLE 29.—Yield of coke from coal in the United States, 1937 and 1948–50, by States, in percent

State	1937		1948		1949		1950	
	Oven coke	Beehive coke	Oven coke	Beehive coke	Oven coke	Beehive coke	Oven coke	Beehive coke
Alabama	72.37	--------	71.52	--------	70.87	--------	70.95	--------
California	--------	--------	61.53	--------	59.91	--------	60.60	--------
Colorado	67.36	55.71	69.09	--------	66.61	--------	68.12	--------
Illinois	70.54	--------	70.39	--------	69.61	--------	70.07	--------
Indiana	72.04	--------	72.23	--------	72.17	--------	73.70	--------
Maryland	72.62	--------	71.45	--------	71.83	--------	71.72	--------
Massachusetts	69.99	--------	71.48	--------	70.49	--------	71.63	--------
Michigan	71.05	--------	71.24	--------	71.38	--------	73.37	--------
Minnesota	70.27	--------	71.82	--------	71.17	--------	72.77	--------
New Jersey	70.78	--------	72.13	--------	73.17	--------	71.83	--------
New York	71.75	--------	69.31	--------	69.89	--------	68.70	--------
Ohio	71.61	--------	70.60	--------	70.23	--------	70.20	--------
Pennsylvania	68.83	65.50	68.72	64.38	68.22	64.53	69.08	64.42
Tennessee	69.00	53.89	73.42	--------	69.98	--------	73.38	--------
Texas	--------	--------	70.96	--------	70.09	--------	71.40	--------
Utah	56.67	54.25	60.78	52.83	61.49	54.23	64.10	54.61
Virginia	--------	58.33	--------	58.30	--------	59.78	--------	61.29
Washington	56.11	--------	--------	--------	--------	--------	--------	--------
West Virginia	70.67	61.74	69.61	64.08	70.42	64.01	70.96	62.59
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	73.57	--------	73.73	62.14	73.47	62.90	73.49	74.92
United States average	70.73	64.23	70.22	63.73	69.98	63.78	70.47	64.12

Sources.—Because all coals will not fuse and form a coherent, strong, porous structure when heated to high temperatures (above 1,000° C.) in the absence of air, sources of coking coals are of extreme importance. Deposits of high-grade coals of established coking quality in the United States are being depleted because of unusually heavy war and civilian industrial demands. Coking-coal deposits are distributed irregularly and limited to relatively few geographic areas. The largest concentration of coking coal is in the Appalachian region, extending from Alabama to Pennsylvania. It is significant that normally about 95 percent of the coal used in coke manufacture is mined in the States comprising this region, whereas the estimated total recoverable reserves of coal in this region on January 1, 1950 (assuming 50 percent recovery), was under 29 percent of the United States total. The balance (about 5 percent) of the coal used in coke ovens comes from relatively small deposits in southern Colorado, northern New Mexico, certain counties in Utah, eastern Oklahoma, western Arkansas, and Illinois. The better-quality high-volatile and medium-volatile coking coals are found in West Virginia, Pennsylvania, eastern Kentucky, and Alabama. Low-volatile coking coals, which are important for improving the physical properties of metallurigical coke, especially its strength, come largely from West Virginia and to a lesser extent from central Pennsylvania, eastern Oklahoma, and western Arkansas.

To maintain a more uniform quality of coal and also to be assured of supplies in periods of extremely heavy demand, many larger coke-producing companies, especially those connected with the iron and steel industries, own or control coal mines. The quantity of coal shipped from such mines, known as "captive" mines, to oven-coke plants in

1950 was 56 percent of the total receipts of all coal for coking at slot-type ovens. Oven-coke plants associated with iron and steel works (classified as furnace plants) received 62 percent of their total receipts from captive mines. The merchant, or nonfurnace, plants, however, obtained only 29 percent of their total shipments from captive mines.

Blending.—Blending or mixing various types of coal before charging into ovens is an integral part of coal preparation at virtually all oven-coke plants. Many coke plants received coal from a number of mines and from different coal-producing fields. The quality of coal varies widely from field to field and even within the same field, and ample mixing facilities are necessary to obtain a uniform quality. A better coke can be obtained by a proper blend of two, three, or more different coals than from any one alone. Blending has several objectives and considers many factors important to the oven-coke plant operators; the primary objective is to produce economically a quality of coke satisfactory for the use intended. It also permits use of coals that have good coking properties but may be otherwise objectionable from the standpoint of excessive ash, sulfur, or phosphorus content and cannot be used alone as a 100-percent charge. Thus, in addition to providing a means of controlling the quality and strength of the coke and the yield of coproducts, blending permits flexible operation at oven-coke plants and use of a wider variety of coking coals. All oven-coke plants mix, or blend, coals before charging them into ovens. However, the mixing of coal of different volatile content was practiced at only 79 oven-coke plants in 1950. Of these plants, 56 used high- and low-volatile coal; 18, high-, medium-, and low-; 3, high- and medium-; and 2, low- and medium-volatile. Of the plants that did not blend coals of different volatile contents, three plants used straight high-volatile and three medium-volatile. The proportion of the different volatile contents of coals mixed before charging into ovens where practiced, varies widely from plant to plant, according to local conditions. Generally, about 20 percent low-volatile coal is used, although some plants reported using as much as 50 percent low-volatile.

TABLE 30.—Coal received for manufacturing oven coke in the United States in 1950, by fields of origin

State and district where coal was produced	Quantity received (net tons)	States where coal was consumed, in order of importance
Alabama	8,873,356	Alabama and Texas.
Arkansas	255,170	Colorado, California, and Illinois.
Colorado	880,814	Colorado.
Georgia	2,724	Tennessee.
Illinois	579,074	Illinois, Indiana, Missouri, and Minnesota.
Indiana	17,804	Indiana and Wisconsin.
Kentucky:		
Elkhorn	6,342,367	Indiana, Michigan, Ohio, Illinois, New York, Pennsylvania, Wisconsin, West Virginia, Massachusetts, New Jersey, and Maryland.
Harlan	6,008,570	Indiana, Illinois, Ohio, Minnesota, Pennsylvania, and New York.
Hazard	31,931	Illinois, Ohio, and Pennsylvania.
Kenova-Thacker	634,127	Ohio, Wisconsin, New York, and Pennsylvania.
Southern Appalachian	100,424	Tennessee and Ohio.
New Mexico	345,096	Colorado and California.
Oklahoma	1,021,540	Texas, Utah, and Missouri.

TABLE 30.—Coal received for manufacturing oven coke in the United States in 1950, by fields of origin—Continued

State and district where coal was produced	Quantity received (net tons)	States where coal was consumed, in order of importance
Pennsylvania:		
Anthracite	166,739	Pennsylvania, Alabama, New York, Missouri, Minnesota, West Virginia, Illinois, Wisconsin, and Ohio.
Bituminous:		
Central Pennsylvania:		
High-volatile	379,633	New York and West Virginia.
Medium-volatile	581,681	New York and Pennsylvania.
Low-volatile	4,741,289	Pennsylvania, New York, Maryland, West Virginia, and Ohio.
Connellsville	12,162,321	Pennsylvania, Ohio, West Virginia, New York, and Maryland.
Freeport	2,821,453	West Virginia, Ohio, Michigan, New York, and Pennsylvania.
Pittsburgh	10,164,733	Pennsylvania, Ohio, New York, Illinois, West Virginia, Wisconsin, and Indiana.
Somerset	651,643	Pennsylvania, New York, Maryland, West Virginia, and Ohio.
Westmoreland	462,727	Pennsylvania, Ohio, New York, and Maryland.
Tennessee	266,701	Tennessee, Illinois, Alabama, and New York.
Utah	2,325,891	Utah and California.
Virginia:		
Clinch Valley	1,746,932	Ohio, Michigan, New York, Illinois, Indiana, Wisconsin, Maryland, Pennsylvania, West Virginia, and Massachusetts.
Pocahontas	999,410	Indiana, Rhode Island, and New York.
Southwestern	1,018,515	New York, New Jersey, Pennsylvania, Missouri, Connecticut, Alabama, and Illinois.
West Virginia:		
Coal River	207,038	Connecticut, West Virginia, Illinois, and Ohio.
Fairmont	4,985,357	Maryland, West Virginia, Pennsylvania, New York, Michigan, and Massachusetts.
Kanawha	7,029,531	Pennsylvania, Ohio, New Jersey, West Virginia, Kentucky, Illinois, Massachusetts, New York, Rhode Island, Michigan, Minnesota, Missouri, Connecticut, Wisconsin, Indiana, and Maryland.
Kenova-Thacker	111,697	New York, Connecticut, Indiana, Ohio, Maryland, and Michigan.
Logan	4,002,225	Indiana, Ohio, Pennsylvania, New York, New Jersey, Massachusetts, Illinois, Wisconsin, Connecticut, Michigan, Minnesota, Missouri, Kentucky, and West Virginia.
New River:		
High-volatile	718,430	New York, New Jersey, Rhode Island, Massachusetts, and Indiana.
Medium-volatile	207,671	Ohio.
Low-volatile	561,024	Maryland, Pennsylvania, Michigan, Ohio, and Rhode Island.
Panhandle	221,890	Pennsylvania and New York.
Pacahontas	14,279,648	Indiana, Ohio, Illinois, Michigan, Pennsylvania, Minnesota, West Virginia, Wisconsin, New York, Alabama, Maryland, Kentucky, Connecticut, Missouri, Tennessee, Rhode Island, and Massachusetts.
Preston-Taylor	92,347	West Virginia, New York, and Pennsylvania.
Randolph-Barbour	867,298	Pennsylvania, Ohio, Minnesota, and New York.
Tug River	349,466	Maryland, West Virginia, Kentucky, and New York.
Webster-Gauley	1,536,895	Pennsylvania, New York, New Jersey, Illinois, Ohio, Maryland, Indiana, and Missouri.
Winding Gulf	2,127,129	Ohio, New Jersey, New York, Massachusetts, Michigan, Rhode Island, West Virginia, Kentucky, Illinois, Indiana, and Missouri.
Total	100,880,311	

TABLE 31.—Coal received for manufacturing oven coke in the United States in 1950, by States where produced and where consumed, in net tons

State where coal was consumed	Coal produced in—														
	Alabama	Arkansas	Colorado	Georgia	Illinois	Indiana	Kentucky	New Mexico	Oklahoma	Pennsylvania	Tennessee	Utah	Virginia	West Virginia	Total
Alabama:															
Merchant plants	998,785									25,656	2,703		11,990	194,855	1,233,989
Furnace plants	7,663,735										17,263			18,268	7,699,266
Total Alabama	8,662,520									25,656	19,966		11,990	213,123	8,933,255
California: Furnace plant		81,557						36,728				754,201			872,486
Colorado: Furnace plant		173,370	880,814					308,368							1,362,552
Illinois:															
Merchant plants							107,491			10,465	24,855		2,513	675,334	820,658
Furnace plants		243			437,925		2,122,327			60,100			121,231	1,755,113	4,496,939
Total Illinois		243			437,925		2,229,818			70,565	24,855		123,744	2,430,447	5,317,597
Indiana:															
Merchant plants						11,395							95,048	1,042,746	1,149,189
Furnace plants					128,375		4,606,654			400			994,397	5,048,155	10,777,981
Total Indiana					128,375	11,395	4,606,654			400			1,089,445	6,090,901	11,927,170
Maryland: Furnace plant							5,810			426,906			33,845	3,165,223	3,631,784
Massachusetts: Merchant plant							86,252						1,554	1,103,067	1,190,873
Michigan:															
Merchant plants										197,386			114,706	525,911	838,003
Furnace plants							1,211,271			94,246			468,262	1,452,613	3,226,392
Total Michigan							1,211,271			291,632			582,968	1,978,524	4,064,395
Minnesota:															
Merchant plant					3,053					16,166				210,441	229,660
Furnace plants							699,681							409,079	1,108,760
Total Minnesota					3,053		699,681			16,166				619,520	1,338,420
New Jersey: Merchant plants							58,312						236,850	1,886,934	2,182,096

New York:															
Merchant plants							493,259			1,270,308	13,172		383,686	1,988,716	4,149,141
Furnace plants							476,398			2,746,816			358,347	930,987	4,512,548
Total New York							969,657			4,017,124	13,172		742,033	2,919,703	8,661,689
Ohio:															
Merchant plants							124,768						400,585	1,133,924	1,659,277
Furnace plants							2,430,649			5,121,552			283,504	5,679,194	13,514,899
Total Ohio							2,555,417			5,121,552			684,089	6,813,118	15,174,176
Pennsylvania:															
Merchant plants										17,156			121,269	765,919	904,344
Furnace plants							346,552			19,557,360			14,258	4,321,917	24,240,087
Total Pennsylvania							346,552			19,574,516			135,527	5,087,836	25,144,431
Tennessee: Furnace plant				2,724			95,903				208,708			26,879	334,214
Texas: Furnace plants	210,836								796,359						1,007,195
Utah: Furnace plants									207,795			1,571,690			1,779,485
West Virginia:															
Merchant plants										45,411				995,574	1,040,985
Furnace plants							92,443			2,510,569			4,162	1,235,221	3,842,395
Total West Virginia							92,443			2,555,980			4,162	2,230,795	4,883,380
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin: Merchant plants					9,721	6,409	159,649		17,386	31,722			118,650	2,731,576	3,075,113
Grand total	8,873,356	255,170	880,814	2,724	579,074	17,804	13,117,419	345,096	1,021,540	32,132,219	266,701	2,325,891	3,764,857	37,297,646	100,880,311
At merchant plants	998,785				12,774	17,804	1,029,731		17,386	1,614,270	40,730		1,486,851	13,254,997	18,473,328
At furnace plants	7,874,571	255,170	880,814	2,724	566,300		12,087,688	345,096	1,004,154	30,517,949	225,971	2,325,891	2,278,006	24,042,649	82,406,983

TABLE 32.—Coal received for manufacturing oven coke in the United States in 1950, by States where consumed and by volatile content [1]

State where coal was consumed	High-volatile		Medium-volatile		Low-volatile		Total coal received (net tons)
	Net tons	Percent of total	Net tons	Percent of total	Net tons	Percent of total	
Alabama:							
Merchant plants	86,497	7.0	926,981	75.1	220,511	17.9	1,233,989
Furnace plants	343,824	4.5	7,337,174	95.3	18,268	.2	7,699,266
Total Alabama	430,321	4.8	8,264,155	92.5	238,779	2.7	8,933,255
California: Furnace plant	790,929	90.7			81,557	9.3	872,486
Colorado: Furnace plant	1,189,182	87.3			173,370	12.7	1,362,552
Illinois:							
Merchant plants	179,361	21.9	304,921	37.2	336,376	40.9	820,658
Furnace plants	2,538,043	56.4	697,384	15.5	1,261,512	28.1	4,496,939
Total Illinois	2,717,404	51.1	1,002,305	18.8	1,597,888	30.1	5,317,597
Indiana:							
Merchant plants	540,312	47.0	141,863	12.4	467,014	40.6	1,149,189
Furnace plants	5,397,899	50.1			5,380,082	49.9	10,777,981
Total Indiana	5,938,211	49.8	141,863	1.2	5,847,096	49.0	11,927,170
Maryland: Furnace plant	2,430,807	66.9			1,200,977	33.1	3,631,784
Massachusetts: Merchant plant	647,829	54.4	277,538	23.3	265,506	22.3	1,190,873
Michigan:							
Merchant plants	321,685	38.4	146,816	17.5	369,502	44.1	838,003
Furnace plants	2,153,313	66.7	12,751	.4	1,060,328	32.9	3,226,392
Total Michigan	2,474,998	60.9	159,567	3.9	1,429,830	35.2	4,064,395
Minnesota:							
Merchant plant	126,565	55.1	11,135	4.8	91,960	40.1	229,660
Furnace plants	699,681	63.1	7,093	.6	401,986	36.3	1,108,760
Total Minnesota	826,246	61.7	18,228	1.4	493,946	36.9	1,338,420
New Jersey: Merchant plants	1,337,040	61.3	446,832	20.5	398,224	18.2	2,182,096
New York:							
Merchant plants	2,588,127	62.4	965,755	23.3	595,259	14.3	4,149,141
Furnace plants	2,244,393	49.7	108,323	2.4	2,159,832	47.9	4,512,548
Total New York	4,832,520	55.8	1,074,078	12.4	2,755,091	31.8	8,661,689
Ohio:							
Merchant plants	1,113,810	67.1	114,319	6.9	431,148	26.0	1,659,277
Furnace plants	8,927,101	66.0	441,930	3.3	4,145,868	30.7	13,514,899
Total Ohio	10,040,911	66.2	556,249	3.7	4,577,016	30.1	15,174,176
Pennsylvania:							
Merchant plants	565,644	62.5	179,537	19.9	159,163	17.6	904,344
Furnace plants	19,301,643	79.6	784,913	3.2	4,153,531	17.2	24,240,087
Total Pennsylvania	19,867,287	79.0	964,450	3.8	4,312,694	17.2	25,144,431
Tennessee: Furnace plant	100,280	30.0	207,055	62.0	26,879	8.0	334,214
Texas: Furnace plants	605,978	60.2	264,431	26.2	136,786	13.6	1,007,195
Utah: Furnace plants	1,571,690	88.3			207,795	11.7	1,779,485
West Virginia:							
Merchant plants	995,574	95.6			45,411	4.4	1,040,985
Furnace plants	3,151,940	82.0			690,455	18.0	3,842,395
Total West Virginia	4,147,514	84.9			735,866	15.1	4,883,380
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin: Merchant plants	1,992,386	64.8	154,677	5.0	928,050	30.2	3,075,113
Grand total	61,941,533	61.4	13,531,428	13.4	25,407,350	25.2	100,880,311
At merchant plants	10,494,830	56.8	3,670,374	19.9	4,308,124	23.3	18,473,328
At furnace plants	51,446,703	62.4	9,861,054	12.0	21,099,226	25.6	82,406,983

[1] High-volatile—dry volatile matter more than 31 percent; medium-volatile—dry volatile matter 31 percent or less and more than 22 percent; low-volatile—dry volatile matter 22 percent or less and more than 14 percent.

SHIPMENTS BY RAIL, WATER, AND TRUCK

Normally, only about 36 percent of the oven coke produced is shipped outside the producing plants because many of the larger oven-coke plants are integrated with iron blast furnaces and all of the large coke suitable for metallurgical use is transferred to the blast furnaces without leaving the establishment. Only 25 percent of all coke produced at furnace plants moved outside the plants in 1950. Of the coke produced by merchant plants, 84 percent was shipped. The principal method of moving oven coke is by rail, which accounted for 90 percent of total shipments in 1950. Movements by water and truck have not varied much in recent years and accounted for 3 and 7 percent, respectively, in 1950.

Beehive coke, unlike oven coke, is produced in plants at or near coal mines, and virtually all of the coke is shipped to centers of consumption. The percentage of beehive coke shipped by rail exceeds that for oven coke because it is used mainly for industrial purposes outside the producing areas. Movement of beehive coke by water and truck is small. Only a few plants are on waterways, and trucking coke long distances is not economically feasible.

TABLE 33.—Coke and breeze sold and loaded at plants in the United States for shipment in 1950, in net tons

State	Coke				Breeze			
	In railroad cars	In boats	In trucks	Total	In railroad cars	In boats	In trucks	Total
Oven coke:								
Alabama	1,011,617	-------	11,516	1,023,133	204,267	-------	-------	204,267
California	362	-------	39	401	19,899	-------	292	20,191
Colorado	63,244	-------	638	63,882	24,059	-------	80	24,139
Illinois	1,660,955	-------	15,128	1,676,083	134,665	6,277	9,527	150,469
Indiana	1,800,805	-------	47,361	1,848,166	120,176	785	55	121,016
Maryland	-------	-------	-------	-------	49,056	10,624	-------	59,680
Massachusetts	359,211	19,472	444,750	823,433	5,864	-------	6,083	11,947
Michigan	656,292	30,576	63,236	750,104	30,219	-------	3,800	34,019
Minnesota	244,139	-------	11,124	255,263	34,248	-------	-------	34,248
New Jersey	778,228	248,653	227,316	1,254,197	-------	-------	6	6
New York	2,158,745	61,771	349,967	2,570,483	32,838	4,695	485	38,018
Ohio	2,364,120	70,752	155,853	2,590,725	224,061	17,885	721	242,667
Pennsylvania	7,147,496	166,645	162,001	7,476,142	217,976	71,720	715	290,411
Tennessee	111,751	-------	-------	111,751	7,726	-------	-------	7,726
Texas	125,638	-------	-------	125,638	38,870	-------	-------	38,870
Utah	107,488	-------	6,718	114,206	84,613	-------	227	84,840
West Virginia	1,362,417	-------	-------	1,362,417	25,133	-------	82	25,215
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	1,728,043	66,983	259,469	2,054,495	11,523	-------	7,789	19,312
Total	21,680,551	664,852	1,755,116	24,100,519	1,265,193	111,986	29,862	1,407,041
At merchant plants	8,390,379	442,977	1,586,878	10,420,234	113,134	29,370	15,824	158,328
At furnace plants	13,290,172	221,875	168,238	13,680,285	1,152,059	82,616	14,038	1,248,713
Beehive coke:								
Kentucky	49,233	-------	-------	49,233	-------	-------	-------	-------
Pennsylvania	5,108,211	60,401	1,319	5,169,931	32,736	7,627	-------	40,363
Utah	75,259	-------	23	75,282	-------	-------	1,208	1,208
Virginia	197,389	-------	291	197,680	1,946	-------	-------	1,946
West Virginia	299,807	-------	14	299,821	996	-------	5,607	6,603
Total	5,729,899	60,401	1,647	5,791,947	35,678	7,627	6,815	50,120

TABLE 34.—Beehive coke loaded for shipment on originating railroads, waterways, and trucks in the United States in 1950, by routes, as reported by producers

Route	Producing State	Net tons: By States	Net tons: Total	Percent of total
Railroads:				
Baltimore & Ohio	Pennsylvania	1,004,828	1,223,189	21.1
	West Virginia	218,361		
Chesapeake & Ohio	Kentucky	49,233	70,247	1.2
	West Virginia	21,014		
Denver & Rio Grande Western	Utah	75,259	75,259	1.3
Huntingdon & Broadtop Mountain	Pennsylvania	9,458	9,458	.2
Interstate	Virginia	165,983	165,983	2.9
Ligonier Valley	Pennsylvania	20,091	20,091	.3
Monongahela	do	1,332,672	1,332,672	23.0
New York Central	West Virginia	45,229	45,229	.8
Norfolk & Western	Virginia	31,406	31,406	.5
Pennsylvania	Pennsylvania	2,463,774	2,463,774	42.5
Pittsburgh & Lake Erie	do	277,388	277,388	4.8
Western Maryland	West Virginia	15,203	15,203	.3
Total railroad shipments		5,729,899	5,729,899	98.9
Waterways: Monongahela and Ohio Rivers	Pennsylvania	60,401	60,401	1.1
Trucks	(1)	1,647	1,647	(2)
Grand total		5,791,947	5,791,947	100.0

[1] Pennsylvania, Utah, Virginia, and West Virginia.
[2] Less than 0.05 percent.

DISTRIBUTION OF OVEN AND BEEHIVE COKE

The accompanying table shows the quantity of coke and coke breeze distributed to each State in 1950, according to principal end uses. A relatively few States; which have a large concentration of heavy industries, consume the bulk of the national total, although every State, as well as the District of Columbia, used some coke. Pennsylvania and Ohio are the main consuming States and together used 43 percent of the total coke distributed in 1950. Following these States were Indiana, New York, Illinois, and Alabama, in the order named, which, combined, accounted for 33 percent. Thus, these six States consumed over three-fourths of all the coke used in the United States. This is due to the large number of iron blast furnaces in these States and the fact that blast furnaces in the United States as a whole consumed 83 percent of all coke. The movement of the balance of the coke consumed was far more widespread, particularly that used in iron foundries and for miscellaneous industries. As in the past, Michigan was the leading State in foundry-coke consumption, with 19 per cent of the total, due to the large quantities of castings made in the automotive industry in the Detroit area. The quantity of coke used in foundries in 1950 exceeded the tonnage used for manufacturing water gas for the first time since 1941. The use of coke for the manufacture of water gas has declined nearly 800,000 tons since 1948.

It is expected that this trend will continue, as coke is being replaced by natural gas in both the fuel and chemical fields. Gas utilities in New York, however, still use large quantities of water-gas coke, and in 1950 this State consumed about one-third of the total. Consumption of water-gas coke in West Virginia dropped 48 percent because one of the large chemical plants that used coke in manufacturing synthetic ammonia did not operate part of the year. The downward trend in the use of coke for household heating continued, and only 3 percent of the total distributed was destined for the domestic-coke trade. Most of the coke used for household heating was consumed in States along the Atlantic seaboard, particularly New York, Massachusetts, and New Jersey.

TABLE 35.—Oven and beehive coke and breeze distributed to each State in 1950, in net tons

[Based upon reports from all United States producers showing destination of coke used by producer or sold in 1950. Does not include imported coke, which totaled 437,585 tons in 1950]

Consuming State	Coke							Coke breeze
	Furnace use	Foundry use	Making producer gas	Making water gas	Other industrial use	Domestic use	Total	
Alabama	4,856,841	208,133	--------	--------	175,450	32,708	5,273,132	203,551
Arizona	--------	4,718	--------	--------	676	--------	5,394	--------
Arkansas	--------	916	--------	--------	99	--------	1,015	4,315
California	495,593	65,070	--------	--------	75,214	--------	635,877	44,508
Colorado	738,008	10,658	--------	--------	44,121	604	793,391	66,510
Connecticut	--------	55,860	90,620	131,537	4,246	111,234	393,497	47,026
Delaware	--------	2,922	--------	177	798	660	4,557	8,533
District of Columbia	--------	--------	--------	--------	48	--------	48	--------
Florida	--------	1,893	--------	34,338	843	1,338	38,412	21,339
Georgia	--------	14,822	--------	3,791	3,893	14,001	36,507	--------
Idaho	--------	883	--------	--------	1,319	114	2,316	--------
Illinois	5,006,095	303,583	--------	19,723	117,237	118,252	5,564,890	409,770
Indiana	6,529,271	190,481	11,989	49,909	145,975	126,571	7,054,196	606,093
Iowa	--------	68,577	--------	177	23,601	3,603	95,958	36,149
Kansas	--------	12,943	--------	--------	1,158	--------	14,101	347
Kentucky	648,775	41,783	--------	36,942	49,124	31,144	807,768	61,202
Louisiana	--------	3,688	--------	--------	41,981	776	46,445	80
Maine	--------	7,633	--------	12,633	138	18,553	38,957	--------
Maryland	2,795,225	34,570	--------	10,714	45,193	851	2,886,553	236,991
Massachusetts	96,023	65,037	116,759	238,677	9,901	395,278	921,675	113,971
Michigan	1,853,327	652,238	--------	--------	234,265	201,359	2,941,189	228,384
Minnesota	642,807	33,410	6,439	9,696	31,438	48,327	772,117	65,123
Mississippi	--------	858	--------	--------	70	126	1,054	160
Missouri	--------	76,012	--------	--------	26,820	4,175	107,007	3,978
Montana	--------	1,135	--------	--------	16,845	--------	17,980	29,688
Nebraska	--------	3,682	--------	--------	383	38	4,103	2,576
Nevada	--------	--------	--------	--------	8,321	--------	8,321	--------
New Hampshire	--------	3,452	--------	7,935	245	21,070	32,702	--------
New Jersey	--------	111,905	111,359	336,428	77,247	347,933	984,872	172,257
New Mexico	--------	233	--------	--------	2,365	--------	2,598	--------
New York	3,794,288	163,301	280,683	1,098,758	267,198	545,081	6,149,309	535,970
North Carolina	--------	16,762	--------	1,647	7,475	3,605	29,489	40
North Dakota	--------	249	--------	--------	183	260	692	--------
Ohio	11,110,332	387,161	--------	294,508	193,324	88,420	12,073,745	769,404
Oklahoma	--------	5,013	--------	--------	97	--------	5,110	13,753
Oregon	--------	5,559	--------	--------	28,661	57	34,277	3,630
Pennsylvania	18,411,856	377,726	85,781	84,329	330,838	185,720	19,476,250	1,363,191
Rhode Island	--------	10,420	38,092	39,130	1,180	61,654	150,476	24,074
South Carolina	--------	5,034	--------	1,485	20,724	2,137	29,380	3,519
South Dakota	--------	372	--------	--------	241	316	929	--------
Tennessee	115,528	101,533	--------	27,174	36,417	4,921	285,573	229,480
Texas	563,951	52,501	--------	--------	41,570	--------	658,022	41,121
Utah	1,051,617	15,371	--------	--------	46,780	3,211	1,116,979	98,669
Vermont	--------	5,536	--------	2,134	1,026	8,753	17,449	--------
Virginia	82,631	46,306	--------	343,904	74,339	530	547,710	2,235
Washington	--------	9,910	--------	--------	6,821	--------	16,731	7,688
West Virginia	2,092,728	26,717	--------	381,745	131,566	495	2,633,251	193,083
Wisconsin	--------	183,887	14,127	317	12,796	124,145	335,272	50,783
Wyoming	--------	--------	--------	--------	2,077	--------	2,077	--------
Total	60,884,896	3,390,453	755,849	3,167,808	2,342,327	2,508,020	73,049,353	5,699,191
Exported	33,653	132,943	--------	--------	100,513	57,156	324,265	27,339
Grand total	60,918,549	3,523,396	755,849	3,167,808	2,442,840	2,565,176	73,373,618	5,726,530

CONSUMPTION OF COKE

The indicated (apparent) consumption of coke, allowing for imports, exports, and changes in producers' stocks, increased 16 percent over 1949 but was over 250,000 tons below the previous maximum in 1948. The tightness in coke supply in 1950 is clearly indicated (table 36) by the excess of imports over exports and the decline in producers' stocks of coke by over 650,000 tons.

The principal reason for the tightness in supply was the unusual demand for blast-furnace coke following the outbreak of hostilities in Korea. Consumption of coke in iron blast furnaces was the highest on record, and the proportion of the total consumption so used was the highest since 1918. For the second consecutive year the fuel efficiency of blast furnaces improved. According to data compiled by the American Iron and Steel Institute, the quantity of coke required to produce 1 ton of pig iron dropped 27.3 pounds (2 percent) and for pig iron and ferro-alloys combined the decline was 30.3 pounds. This improvement could be attributed to a number of factors, such as increased proportion of pig iron being made in furnaces with a low coke-pig ratio, the increased tonnages of imported high-grade ore being charged, increased proportion of scrap charged into blast furnaces, and also to improvement in coal and coke quality because of recent expansion of coal-cleaning facilities.

The quantity of coke consumed for other than blast furnaces increased slightly over 1949, but the percentage so used declined from 19 percent to 17 percent. This decline was due largely to a sharp reduction in coke requirements for water-gas manufacture and to a further drop in sales of coke for residential heating.

TABLE 36.—Coke consumed in manufacture of pig iron and for other purposes in the United States, 1913, 1918, 1937, and 1948–50, in net tons

Year	Total production	Imports	Exports	Net change in stocks	Apparent United States consumption [1]	Consumed by iron furnaces [2]		Remainder consumed in other ways	
						Quantity	Percent	Quantity	Percent
1913	46,299,530	101,212	987,395	(3)	45,413,347	37,192,287	81.9	8,221,060	18.1
1918	56,478,372	30,168	1,687,824	(3)	54,820,716	45,703,594	83.4	9,117,122	16.6
1937	52,375,469	286,364	526,683	+863,221	51,271,929	37,599,911	73.3	13,672,018	26.7
1948	74,861,928	161,400	706,782	+561,204	73,755,342	59,128,129	80.2	14,627,213	19.8
1949	63,637,429	277,507	548,256	+176,015	63,190,665	51,356,617	81.3	11,834,048	18.7
1950	72,718,038	437,585	397,846	−658,742	73,416,519	61,039,227	83.1	12,377,292	16.9

[1] Production plus imports minus exports, plus or minus net changes in stocks.
[2] American Iron and Steel Institute; figures include coke consumed in manufacture of ferro-alloys.
[3] Data not available.

TABLE 37.—Coke and coking coal consumed per net ton of pig iron made in the United States, 1913, 1918, 1937, and 1948–50

Year	Coke per net ton of pig iron and ferro-alloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per net ton of pig iron and ferro-alloys (pounds calculated)	Year	Coke per net ton of pig iron and ferro-alloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per net ton of pig iron and ferro-alloys (pounds calculated)
1913	2,172.6	66.9	3,247.5	1948	1,937.2	69.6	2,783.3
1918	2,120.7	66.4	3,193.8	1949	1,895.8	[2] 69.6	[2] 2,723.9
1937	1,830.6	70.3	2,604.0	1950	1,865.5	69.9	2,668.8

[1] American Iron and Steel Institute; consumption per ton of pig iron only, excluding furnaces making ferro-alloys, was 2,172.6 pounds in 1913, 2,120.7 in 1918, 1,806.7 in 1937, 1,900.0 in 1947, 1,908.0 in 1948, 1,870.4 in 1949, and 1,843.1 in 1950.
[2] Revised figure.

Tables 38 and 39 show the disposal of coke by producers according to principal end uses. In the oven-coke industry many of the larger coke plants are integrated with iron blast furnaces, and virtually all of the coke output at these plants that is suitable for metallurgical fuel is used on the premises. Some of these plants, in addition to providing the coke required by integrated furnaces, also ship coke to other furnaces of the same company or to affiliated companies in other locations. These shipments, although shown as sales in the accompanying table, are really intracompany transfers and are not to be considered merchant sales. The only coke from the furnace-coke plants that is sold on the open market is generally small-size, which is unsuitable for metallurgical purposes. In 1950 furnace oven-coke plants only sold 499,007 tons of foundry coke and 696,847 tons classified as "other industrial"—or 2 percent of their total production. The merchant, or nonfurnace, plants, on the other hand, furnish the bulk of foundry and other industrial coke. Plants in this category, in addition to shipping 2,935,278 tons—or 24 percent of their production—to iron blast furnaces, supplied 85 percent of all oven coke used in foundry cupolas and 79 percent of the coke classified as "other industrial." The domestic (household and commercial) coke trade, which has been declining rapidly since the beginning of World War II, is supplied mainly by the merchant plants.

During the past 2 decades, beehive coke has been an important factor in meeting peak metallurgical-coke requirements. Although some of the large steel producers own or have a financial interest in beehive operations, about 66 percent of the operable capacity is owned by individuals or concerns independent of the iron and steel industry. However, the bulk of all beehive coke is used for metallurgical purposes. In 1950 iron blast furnaces and foundry cupolas received 93 percent, while all other industrial uses, including water-gas manufacture, accounted for 7 percent. Shipments of beehive coke to the domestic-coke trade for residential heating are insignificant.

TABLE 38.—Oven coke produced and sold or used by producer in the United States in 1950, by States

State	Produced		Used by producer [1]—				Sold [2]	
			In blast furnaces		For other purposes [3]		Furnace [4]	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	5,833,142	$64,331,998	4,798,610	$47,153,502	21,947	$206,278	96,660	$1,626,756
California	512,790	(5)	485,724	(5)	322	(5)	-----	-----
Colorado	804,979	(5)	738,008	(5)	4,158	(5)	-----	-----
Illinois	3,590,502	58,141,266	1,919,468	28,252,340	23,996	362,560	1,290,135	23,055,423
Indiana	8,255,622	138,880,962	6,277,235	102,830,045	118,913	1,805,542	1,192,862	(5)
Maryland	2,367,233	(5)	2,345,871	(5)	7,465	(5)	-----	-----
Massachusetts	855,217	(5)	-----	-----	120,391	(5)	96,023	(5)
Michigan	2,730,847	39,191,757	1,809,292	(5)	175,883	2,768,048	44,486	(5)
Minnesota	833,861	13,030,429	642,807	(5)	25,780	255,422	43,295	(5)
New Jersey	1,481,030	(5)	-----	-----	298,375	(5)	263,449	(5)
New York	5,412,318	73,459,620	1,883,662	(5)	1,128,817	14,599,120	1,762,184	22,486,286
Ohio	10,313,767	130,016,706	7,660,499	94,207,822	67,889	927,723	1,429,041	17,845,323
Pennsylvania	16,332,998	201,135,604	8,799,886	103,971,226	148,383	1,811,707	6,571,176	82,704,778
Tennessee	243,950	(5)	115,528	(5)	16,954	(5)	-----	-----
Texas	686,407	(5)	563,951	(5)	3,202	(5)	74,742	(5)
Utah	1,140,737	(5)	1,018,235	(5)	4,717	(5)	33,382	(5)
West Virginia	3,388,626	36,457,582	1,669,518	(5)	361,057	2,945,856	1,134,841	(5)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	2,106,592	31,876,236	-----	-----	154,443	1,987,650	900,728	11,066,584
Undistributed	-----	113,145,167	-----	151,617,460	-----	5,995,714	-----	40,611,722
Total 1950	66,890,618	899,667,327	40,728,294	528,032,395	2,682,692	33,665,620	14,933,004	199,396,872
At merchant plants	12,346,822	190,570,598	-----	-----	2,357,454	29,076,445	2,935,278	43,001,111
At furnace plants	54,543,796	709,096,729	40,728,294	528,032,395	325,238	4,589,175	11,997,726	156,395,761
Total 1949	60,222,481	798,792,069	35,046,393	451,981,030	2,541,388	30,811,299	13,607,428	177,246,816

State	Sold [2]—Continued							
	Foundry [6]		Other industrial (including water gas) [7]		Domestic [8]		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Alabama	519,996	$9,777,007	323,293	$4,892,764	83,184	$867,993	1,023,133	$17,164,520
California			401	(5)			401	(5)
Colorado	4,252	(5)	59,026	(5)	604	(5)	63,882	(5)
Illinois	235,994	4,970,962	74,400	921,511	75,554	1,008,161	1,676,083	29,956,057
Indiana	434,232	(5)	91,760	1,537,298	129,312	1,495,889	1,848,166	34,055,521
Maryland								
Massachusetts	87,626	(5)	278,937	(5)	360,847	(5)	823,433	(5)
Michigan	321,939	(5)	187,827	2,539,463	195,852	2,624,986	750,104	12,703,712
Minnesota	117,838	(5)	38,408	(5)	55,722	(5)	255,263	(5)
New Jersey	172,472	(5)	466,516	(5)	351,760	(5)	1,254,197	(5)
New York	84,482	(5)	225,605	(5)	498,212	6,797,190	2,570,483	34,028,471
Ohio	289,711	5,195,202	771,907	10,687,826	100,066	1,267,588	2,590,725	34,995,939
Pennsylvania	351,696	7,321,054	297,985	4,011,424	255,285	2,660,372	7,476,142	96,697,628
Tennessee	36,543	(5)	72,041	(5)	3,167	(5)	111,751	(5)
Texas	28,800	(5)	22,096	(5)			125,638	(5)
Utah			77,499	(5)	3,325	(5)	114,206	(5)
West Virginia	41,181	(5)	125,470	(5)	60,925	383,053	1,362,417	(5)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	509,456	10,656,646	271,962	3,934,468	372,349	5,853,915	2,054,495	31,511,613
Undistributed		27,056,362		19,630,179		11,674,472		56,049,196
Total 1950	3,236,218	64,977,233	3,385,133	48,154,933	2,546,164	34,633,619	24,100,519	347,162,657
At merchant plants	2,737,211	55,813,020	2,688,286	39,475,165	2,059,459	29,928,032	10,420,234	168,217,328
At furnace plants	499,007	9,164,213	696,847	8,679,768	486,705	4,705,587	13,680,285	178,945,329
Total 1949	2,498,593	49,400,066	3,634,465	49,835,410	2,740,987	37,014,772	22,481,473	313,497,064

1 Comprises only coke used at site.
2 Includes intracompany transfers.
3 Comprises 103,000 tons valued at $1,814,725 used in foundries; 755,849 tons, $9,299,239 to make producer gas; 1,501,979 tons, $18,410,591 to make water gas; and 321,864 tons, $4,141,065 for other purposes.
4 Includes 11,342,443 tons valued at $147,999,186 sold to financially affiliated companies.
5 Included with "Undistributed" to avoid disclosure of individual company operations.
6 Includes 53,530 tons valued at $1,152,019 sold to financially affiliated companies.
7 Includes 695,852 tons valued at $10,207,796 for manufacture of water gas and 161,344 tons, $2,295,432 for other industrial use sold to financially affiliated companies; and 929,463 tons, $14,006,516 for manufacture of water gas sold to other consumers.
8 Household and commercial.

TABLE 39.—Beehive coke produced and sold or used by producers in the United States in 1950, by States

State	Produced		Used by producer[1]				Sold[2]	
			In blast furnaces		For other purposes		Furnace[3]	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Kentucky	49,233	(4)					48,627	(4)
Pennsylvania	5,193,191	$68,086,247	58,447	(4)	2,631	(4)	4,822,383	$63,323,025
Utah	84,808	(4)	8,987	(4)				
Virginia	197,879	(4)					85,824	(4)
West Virginia	302,309	4,307,719			101	(4)	232,983	3,206,124
Undistributed		4,841,909		$795,163		$38,011		1,919,900
Total:								
1950	5,827,420	77,235,875	67,434	795,163	2,732	38,011	5,189,817	68,449,049
1949	3,414,948	43,945,627	67,518	1,137,134	1,779	25,102	2,793,514	34,904,920

State	Sold[2]—Continued							
	Foundry		Other industrial[5] (including water gas)		Domestic[6]		Total	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Kentucky			415	(4)	191	(4)	49,233	(4)
Pennsylvania	135,675	$1,929,260	194,463	$2,443,599	17,410	$201,693	5,169,931	$67,897,577
Utah			75,282	(4)			75,282	(4)
Virginia	18,775	292,150	91,670	(4)	1,411	(4)	197,680	(4)
West Virginia	29,728	543,346	37,110	522,793			299,821	4,272,263
Undistributed				2,479,079		23,361		4,714,490
Total:								
1950	184,178	2,764,756	398,940	5,445,471	19,012	225,054	5,791,947	76,884,330
1949	199,880	3,050,392	315,435	4,324,419	14,853	175,269	3,323,682	42,455,000

[1] Comprises only coke used at site.
[2] Includes intracompany transfers.
[3] Includes 1,838,547 tons valued at $23,017,375 sold to financially affiliated companies for blast furnace use.
[4] Included with "Undistributed" to avoid disclosure of individual company operations.
[5] Includes 1,871 tons valued at $26,654 sold to financially affiliated companies for other industrial use; and 40,514 tons valued at $566,175 sold to other producers for the manufacture of water gas.
[6] Household and commercial.

STOCKS OF COKE AND COKING COAL

Coke.—Producers' stocks of coke usually decrease when steel production and industrial activity are increasing. The output of coke did not keep pace with the rising demand in 1950, and stocks of oven coke dropped 36 percent while beehive coke stocks decreased 66 percent. The largest decrease in stocks was registered by domestic and other grades at oven-coke plants, which fell 62 percent, although the quantity of furnace and foundry grades dropped 10 and 36 percent, respectively. The large decrease in stocks of domestic and other coke was due principally to the fact that a number of "merchant" oven-coke plants curtailed production of domestic sizes to meet the increased requirement of metallurgical and other industrial grades. Normally, furnace plants carry only a few days' supply because of the vertical integration of their operations. Merchant plants, however, often find it necessary to stock coke, especially the domestic sizes. The total quantity of oven coke stocked at producers' plants on December 31, 1950, was equivalent only to 6 days' production at the prevailing rate. Producers' stocks of beehive coke, which usually are even smaller than stocks carried by oven-coke plants, amounted only to 1 day's production at the December rate.

Coal.—Adequate stocks of bituminous coal at oven-coke plants are necessary because of the continuous nature of the carbonizing process. A 30 days' supply of coal is usually the minimum desired by most oven-coke plant operators to safeguard against disruption in the flow of coal to the plants. Coke plants, however, which are located on the upper Lakes and are supplied mostly by Lake carriers, build up their inventories during the shipping season in order to have enough coal to carry them through the winter. These plants usually have 90 to 120 or more days' supply when the shipping season closes. Stocks of bituminous coal fluctuated widely during 1950 and ranged from a 17 days' supply in February to 61 days' in December, based on normal operating rates of coal consumption. The quantity on hand at producers' plants at the end of the year was the highest on record.

TABLE 40.—Summary of total stocks of coke on hand at all coke plants in the United States on Jan. 1, 1937, and 1947–51, in net tons

	1937	1947	1948	1949	1950	1951
Oven-coke plants:						
Furnace	282,144	445,763	376,097	940,727	838,718	756,199
Foundry	8,981	12,565	12,362	7,003	13,120	8,466
Domestic and other	1,408,350	434,585	631,397	612,851	864,720	327,997
Total	1,699,475	892,913	1,019,856	1,560,581	1,716,558	1,092,662
Beehive-coke plants:						
Furnace	5,622	30,750	10,181	30,629	51,580	17,068
Foundry	8,508	1,508	50	964	1,118	884
Domestic and other	18,461	3,595	2,150	1,267	200	100
Total	32,591	35,853	12,381	32,860	2,898	18,052
Total:						
Furnace	287,766	476,513	386,278	971,356	890,298	773,267
Foundry	17,489	14,073	12,412	7,967	14,238	9,350
Domestic and other	1,426,811	438,180	633,547	614,118	864,920	328,097
Grand total	1,732,066	928,766	1,032,237	1,593,441	1,769,456	1,110,714

TABLE 41.—Stocks of coke and breeze in the United States on Jan. 1, 1951, by States, in net tons

State	Coke				Breeze
	Furnace	Foundry	Domestic and other	Total	
Oven coke:					
Alabama	101,588	1,469	4,936	107,993	19,194
California	35,844			35,844	29,696
Colorado	4,578			4,578	4,973
Illinois	34,438	260	1,993	36,691	132,740
Indiana	45,491	1,860	9,614	56,965	138,545
Maryland	72,236			72,236	162,754
Massachusetts	81	465	29,974	30,520	2,666
Michigan	5,832	975	13,279	20,086	16,340
Minnesota	6,000		3,076	9,076	16,615
New Jersey			39,719	39,719	11,032
New York	19,413		105,333	124,746	106,459
Ohio	156,906	757	7,027	164,690	86,958
Pennsylvania	205,783	1,140	29,126	236,049	294,161
Tennessee	649	183	815	1,647	1,802
Texas	6,743	66	521	7,330	539
Utah	30,319		15,324	45,643	9,199
West Virginia	29,059		17,192	46,251	68,609
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	1,239	1,291	50,068	52,598	12,380
Total	756,199	8,466	327,997	1,092,662	1,114,662
At merchant plants	4,960	6,124	282,059	293,143	89,861
At furnace plants	751,239	2,342	45,938	799,519	1,024,801
Beehive coke:					
Pennsylvania	13,142	844		13,986	5,253
Utah	620			620	
Virginia	729		100	829	
West Virginia	2,577	40		2,617	
Total	17,068	884	100	18,052	5,253

TABLE 42.—Stocks of oven coke in the United States at end of each month, 1949–50, in net tons

[Includes blast furnace, foundry, and domestic coke, but not breeze]

Month	Furnace plants		Merchant plants		Total	
	1949	1950	1949	1950	1949	1950
January	1,112,854	806,956	428,263	474,028	1,541,117	1,280,984
February	1,121,882	448,304	382,276	206,828	1,504,158	655,132
March	951,999	447,788	360,976	102,109	1,312,975	549,897
April	1,015,200	581,077	458,337	119,087	1,473,537	700,164
May	1,181,898	610,548	565,779	107,563	1,747,677	718,111
June	1,076,677	612,383	628,559	111,288	1,705,236	723,671
July	1,076,861	641,931	829,556	175,620	1,906,417	817,551
August	1,054,108	599,443	972,704	227,799	2,026,812	827,242
September	973,212	584,420	952,499	270,713	1,925,711	855,133
October	1,226,852	660,842	892,996	323,276	2,119,848	984,118
November	1,200,460	751,580	816,841	350,873	2,017,301	1,102,453
December	991,533	799,519	725,025	293,143	1,716,558	1,092,662

TABLE 43.—Stocks of bituminous coal at oven-coke plants in the United States at end of each month, 1937 and 1948–50, in net tons

Month	1937	1948	1949	1950
January	8,030,871	8,670,875	12,480,691	7,087,355
February	8,687,389	8,807,168	13,758,864	3,448,610
March	9,638,317	7,434,582	11,451,673	4,847,923
April	8,543,774	4,307,878	12,913,613	7,490,871
May	8,187,883	7,773,429	15,870,342	9,572,167
June	7,770,256	10,474,191	15,746,565	11,279,551
July	7,432,741	8,974,663	13,895,773	10,385,780
August	7,455,932	10,289,146	13,610,849	12,339,744
September	7,760,533	10,967,839	11,774,213	13,964,334
October	8,066,938	11,347,876	9,946,089	15,665,689
November	8,114,094	11,463,542	10,059,834	16,329,150
December	7,273,403	12,104,428	9,892,891	16,776,070

VALUE AND PRICE

The term "value," as used in this report, is the value of the coke at the ovens as reported by producers. For that part of the output sold, the value is the amount received for the coke f. o. b. ovens. However, the greater part of the coke produced in the United States is made in ovens operated by corporations, which not only mine the coal used in manufacturing coke but also operate blast furnaces and steel mills, consuming the entire output of their ovens. Under such conditions, fixing a value for coal charged and for coke produced is governed by established accounting procedures. For example, at some plants the cost of coke to the furnace department equals the cost of production; at others, a margin of profit is added; or the reported value is based on what the coke would cost if purchased. The average value of all coke produced, measured in the foregoing way, was $13.43 per ton, the highest figure ever recorded and a 1-percent gain over 1949 (table 44).

A large part of the blast-furnace coke reported by the producers as sales is shipped to iron blast furnaces at other locations that are in some way connected with the coke producers and are actually intracompany transfers. Merchant sales of coke, as used in this chapter, do not include intracompany transfers or sales to financially affiliated corporations and represent only sales on the open market to other purchasers. The average price, f. o. b. ovens, received for each ton of coke sold (merchant sales) in 1950 established a new record and was 2 percent over the 1949 figure. Table 45 shows average receipts from sales, classified by uses and by States. It will be noted that prices vary notably with the distances from the coal mines. Thus, the highest average prices are those reported for the New England and Upper Lake States, where coke costs are higher because the coal must be hauled great distances.

TABLE 44.—Average value per net ton of coke produced and average receipts per net ton from coke sold (merchant sales) in the United States, 1937 and 1946–50

Year	Value per ton produced			Receipts per ton sold		
	Oven coke	Beehive coke	Total	Oven coke	Beehive coke	Total
1937	$5.03	$4.31	$4.98	$6.45	$4.25	$6.10
1946	8.35	8.03	8.32	10.25	8.35	9.85
1947	10.65	9.77	10.57	11.98	10.31	11.54
1948	12.43	12.10	12.40	14.74	12.80	14.22
1949	13.26	12.87	13.24	15.12	13.52	14.85
1950	13.45	13.25	13.43	15.66	13.63	15.15

TABLE 45.—Average receipts per net ton of coke sold (merchant sales) in the United States in 1950, by States

State	Oven coke				Beehive coke			
	Furnace	Foundry	Other industrial, including water gas	Domestic[1]	Furnace	Foundry	Other industrial, including water gas	Domestic[1]
Alabama	$17.95	$18.80	$15.13	$10.43				
California, Colorado, Texas, and Utah	(2)	(2)	14.70	(2)			(2)	
Connecticut, Massachusetts, and Rhode Island	15.30	20.89	15.02	15.56				
Illinois	16.49	20.82	12.94	13.34				
Indiana	(2)	20.82	16.76	11.57				
Kentucky, Missouri, and Tennessee	(2)	20.14	16.27	16.12	(2)		(2)	(2)
Michigan, Minnesota, and Wisconsin	16.50	21.43	14.03	14.30				
New Jersey and New York	15.51	18.13	14.38	14.14				
Ohio	13.51	17.95	10.76	12.67				
Pennsylvania	12.73	20.85	13.57	10.42	$13.51	$14.22	$12.55	$11.58
Virginia					(2)	15.56	14.50	(2)
West Virginia	(2)	(2)	8.19	(2)	13.76	18.28	14.09	
Undistributed	12.97	18.87		6.45	14.28		15.18	14.58
United States average 1950	14.31	20.05	14.10	13.60	13.56	15.01	13.65	11.84
At merchant plants	14.75	20.36	14.67	14.53				
At furnace plants	12.86	18.40	12.55	9.67				
United States average 1949	14.09	19.72	13.74	13.50	13.29	15.26	13.71	11.80

[1] Household and commercial use.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

FOREIGN TRADE [1]

Imports.—Statistics on United States imports include coke made both from coal and petroleum, although the two varieties are separated in export statistics. Imports of coke exceeded exports for the first time in 1950, increasing 58 percent over the 1949 total. The total quantity, however, was less than a half million tons and represented less than 1 percent of apparent United States consumption. Canada is traditionally the principal source of imported coke, supplying 84 percent of our total imports in 1950. Significant ton-

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

nage came from the Netherlands, and Germany supplied a small quantity. The largest part of the coke imports entered through the Michigan customs district. Significant tonnages also entered through the Montana and Idaho, Massachusetts, Duluth and Superior, and Buffalo customs districts. The coke entering through the Montana and Idaho customs district probably was used for smelting nonferrous metals, while that coming in by way of Buffalo, Massachusettes, and the Lakes was used for residential heating and miscellaneous industrial purposes. Undoubtedly, some of the coke that entered through the Buffalo gateway was petroleum coke and was used for manufacturing carbon electrodes.

TABLE 46.—Coke imported for consumption in the United States, 1948–50, by countries and customs districts

[U. S. Department of Commerce]

	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
Canada	160,795	$2,096,063	277,507	$3,975,785	365,615	$4,315,394
Germany					3,140	48,676
Netherlands	605	14,212			68,810	932,245
Peru					20	198
Total	161,400	2,110,275	277,507	3,975,785	437,585	5,296,513
CUSTOMS DISTRICT						
Buffalo	38,399	646,606	83,053	1,338,461	27,593	425,636
Chicago	37	621	7,201	17,421	17,035	75,062
Connecticut			180	3,058		
Dakota	1,682	28,577	1,482	8,885	290	1,740
Duluth and Superior					44,796	190,326
Los Angeles					7,034	156,184
Maine and New Hampshire	350	4,707	346	4,946	305	4,229
Massachusetts					55,347	673,451
Michigan	39,597	649,510	114,722	1,813,986	203,445	2,837,749
Montana and Idaho	62,342	696,024	69,157	774,573	70,859	781,001
New York					20	198
Puerto Rico	605	14,212			3,736	44,783
St. Lawrence			458	6,491	2,454	34,646
San Francisco					2,693	57,827
Vermont	109	1,157	316	4,689	353	5,589
Washington	615	7,223	592	3,275	1,577	7,474
Wisconsin	17,664	61,638				
Total	161,400	2,110,275	277,507	3,975,785	[1] 437,585	[1] 5,296,513

[1] Includes shipments on vessels operated by the U. S. Army or Navy as follows: 38 tons, value $618.

Exports.—Before the last quarter of 1949, exports of metallurgical coke were limited under Government control. Exports of coke were not restricted during 1950, but increased requirements in the United States caused shipments to foreign countries to decline 27 percent from 1949. Canada, which has always been considered part of the normal marketing area for some of our coke plants, received 91 percent of the total shipments outside the continental limits of the United States. The quantity shipped to Canada was 16 percent less than in 1949 and 943,835 tons—72 percent—less than the record movement of 1945. Shipments to Mexico declined substantially from 1949, and the total quantity shipped to all other countries was less than 1 day's production of beehive coke.

TABLE 47.—Coke exported from the United States, 1948–50, by countries and customs districts

[U. S. Department of Commerce]

	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
North America:						
Canada	561,621	$7,711,145	428,535	$6,341,577	361,555	$5,621,051
Mexico	36,786	664,079	88,393	1,118,491	30,570	352,165
Panama			11	312	51	2,862
West Indies:						
Cuba	17,730	347,507	13,859	242,473	2,910	74,429
Trinidad and Tobago	104	2,502	194	4,567		
Other North America	1,228	45,929	1,234	36,706	1,134	31,462
South America:						
Argentina	10,146	235,298				
Bolivia	1,188	47,951	1,447	44,692	101	3,651
Brazil	9,599	366,117	1,882	78,752		
Chile	6,424	177,166	5,929	144,107	10	350
Peru	644	23,633				
Uruguay	2,798	117,179				
Venezuela	737	30,212	590	22,274	187	6,714
Other South America	545	21,196	408	17,482	130	5,280
Europe:						
Denmark	43	834	10	214	6	118
France			755	33,950		
Norway	46,598	589,777	123	3,633		
Sweden	7,958	87,404				
Asia:						
China	33	1,512				
Hong Kong			1,646	77,399		
Philippines	2,511	117,349	2,658	138,264	1,147	61,125
Other Asia	89	4,147	582	18,032		
Total	706,782	10,590,937	548,256	8,322,925	397,801	6,159,207
CUSTOMS DISTRICT						
Buffalo	271,733	3,161,885	166,035	2,326,467	170,512	2,482,995
Dakota	20,664	330,742	17,812	321,473	13,230	244,005
Duluth and Superior	6,728	114,971	5,617	99,186	5,133	99,342
El Paso	5,273	132,238	30,938	464,378	255	895
Florida	1,432	30,026	975	25,482	2,767	70,761
Laredo	29,784	487,159	55,997	620,645	26,821	314,295
Los Angeles			10	445	2,413	12,596
Maryland	63,728	944,638	3,187	140,944	70	2,792
Michigan	211,418	3,487,205	223,456	3,371,367	151,362	2,497,641
Mobile	45	1,053	2,346	65,878		
Montana and Idaho	15,519	96,866	81	1,481	42	856
New Orleans	21,696	699,621	8,181	298,520	1,945	60,595
New York	1,179	32,150	6,290	106,583	96	4,012
Ohio	7,692	117,046	11,701	163,411	15,381	202,542
Philadelphia	793	16,797	338	7,509	10	350
Rhode Island	2,071	33,800	7,686	119,076		
Sabine	9,249	179,915				
St. Lawrence	4,250	69,444	1,876	14,506	2,657	32,513
San Diego	965	20,478	717	13,416	556	10,214
San Francisco	1,872	82,451	1,516	70,505	579	24,920
Vermont	12,984	148,938			189	4,451
Virginia	6,491	193,599	1,081	36,815	205	17,024
Washington	9,948	174,607	1,902	43,245	3,049	56,706
Other districts	1,268	35,308	514	11,593	529	19,702
Total	706,782	10,590,937	548,256	8,322,925	397,801	6,159,207

TECHNOLOGY

No spectacular new developments were reported in the field of coal carbonization in 1950, although considerable scientific work was accomplished by Government and State agencies, coal-research laboratories, and individual companies. Many new patents were issued during the year on processes for recovering coal chemicals, improving the efficiency of coke ovens, and development of new products.

The Bureau of Mines, which has conducted scientific and technologic investigations on coal and related products since its creation by Congress, continued its research work in these fields. The Fifteenth Annual Report of Research and Technologic Work conducted by the Bureau of Mines on coal and coal products [2] gives a brief résumé of special studies made by Bureau engineers from July 1, 1949, to July 1, 1950, on the carbonizing properties, plasticity, oxidation, expansion, and washing characteristics of coal. The report lists the original publications describing the individual studies and, in addition, presents research results that have not already been published.

Research achievements of Mellon Institute relating to byproduct coke and coal-chemicals technology during the fiscal year ended February 28, 1951, were summarized in the Thirty-Eighth Annual Report of the institute.[3]

WORLD PRODUCTION

Estimated world production of coke in 1950 increased 8 percent over 1949, reaching an all-time peak. Coke is used principally for industrial purposes, and the highly industrialized countries are generally the leading coke producers. The United States has dominated the world in coke output since 1938 and produced 37 percent of the total in 1950. Germany assumed temporary leadership in coke production in 1938, but war damages and territorial changes reduced production drastically for several years after the war. However, coke production in the famous Ruhr area has been increasing rapidly during the past several years, and production in western Germany (Federal Republic) in 1950 ranked second only to the United States. Little authentic information has been available on output in the Soviet Union since 1937, but estimates for 1950 place it third. Remarkable progress has been made in Russia in the past 20 years, and coking capacity has increased more rapidly than in any other country. Other important coke-producing countries in 1950 were Great Britain, France (including the Saar), Poland, and Czechoslovakia, which combined produced 21 percent of the total. Table 48 contains information on world production so far as data are available.

---

[2] Fieldner, Arno C., and Gottley, Sidney, Annual Report of Research and Technologic Work on Coal, Fiscal Year 1950: Bureau of Mines Inf. Circ. 7618, 1951, 80 pp.

[3] Weidlein, E. R., Current Scientific Researches in Mellon Institute, 1950-51: 38th Ann. Rept. of the President, E. R. Weidlein, to the Board of Trustees of the Institution, for the Fiscal Year Ended Feb. 28, 1951, pp. 21-24.

TABLE 48.—World production of coke by countries, 1938 and 1942–50, in metric tons [1]

[Compiled by Pauline Roberts]

Country	1938	1942	1943	1944	1945	1946	1947	1948	1949	1950
Australia	1,185,151	1,667,426	1,607,629	1,416,947	1,077,725	1,082,949	1,341,305	1,406,455	[2] 1,800,000	[2] 1,800,000
Austria	[2] 375,000	[2] 400,000	[2] 450,000	618,949	69,600	138,000	319,609	591,100	775,900	[2] 1,000,000
Belgium	4,398,520	3,588,190	3,497,450	1,456,240	1,346,610	2,399,778	3,065,705	3,733,858	3,472,284	3,243,036
Brazil	----------	10,267	19,845	[2] 16,000	[2] 20,000	133,542	182,674	265,753	271,710	286,595
Bulgaria	3,923	[2] 5,000	[2] 5,000	[2] 5,000	[2] 5,000	[2] 5,000	[2] 5,000	[2] 8,600	[2] 8,000	[2] 10,000
Canada	1,808,588	2,536,165	2,709,354	3,118,481	3,023,248	2,592,357	2,697,070	3,116,221	3,041,315	[2] 3,100,000
China	[3] 11,630	[4] 388,734	[4] 379,822	[4] 302,466	44,000	95,910	109,000	[2] 92,600	[2] 100,000	[2] 300,000
Czechoslovakia	2,766,000	3,889,000	4,280,000	4,528,000	1,900,557	2,249,859	3,845,000	4,099,000	4,695,000	[2] 4,876,000
France	7,636,150	5,008,360	4,989,580	2,908,655	2,730,485	5,150,774	6,002,603	6,246,859	6,769,000	7,011,745
Saar	3,107,000	3,241,439	3,485,100	2,950,700	386,100	818,700	1,812,800	2,740,200	3,327,000	3,226,989
Germany:										
Federal Republic	40,404,082	[5] 47,996,026	[5] 47,804,000	[5] 41,596,000	[2] 5,384,000	10,404,000	16,154,000	20,279,400	25,140,000	27,333,400
Soviet zone					----------			[2] 225,000	[2] 275,000	[2] 300,000
India	1,738,178	2,129,182	1,815,534	1,656,578	1,660,231	1,701,881	[2] 1,700,000	1,665,797	2,038,319	[2] 2,000,000
Indochina	3,503	4,357	5,293	2,064	----------	----------	----------	----------	----------	----------
Italy	1,739,417	1,668,188	1,531,820	498,825	39,203	445,500	964,470	1,308,640	1,511,171	1,501,616
Japan	[6] 3,724,000	[6] 5,842,000	6,192,000	4,944,000	2,400,000	924,000	1,164,000	1,932,000	2,580,000	1,337,754
Korea:										
North	377,937	582,918	851,307	733,216	69,106	[2] 100,000	[2] 250,000	[2] 300,000	[2] 400,000	[2] 500,000
South						2,657	6,644	10,971	11,514	[2] 10,000
Mexico	[2] 350,000	[2] 400,000	[2] 500,000	[2] 500,000	[2] 500,000	[2] 500,000	530,400	408,000	374,827	391,955
Netherlands	3,158,065	2,048,819	2,163,444	1,575,371	855,542	1,307,768	1,774,023	2,239,500	2,474,400	2,803,900
New Caledonia	49,875	83,661	[2] 80,000	[2] 80,000	[2] 50,000	[2] 60,000	[2] 70,000	[2] 80,000	[2] 80,000	[2] 80,000
New Zealand	----------	----------	4,500	----------	----------	----------	3,631	----------	5,080	5,894
Norway	[2] 100,000	101,226	110,406	78,558	----------	----------	----------	----------	----------	----------
Peru	----------	----------	----------	----------			1,641	1,763		
Poland	2,290,925	3,170,076	3,250,344	4,544,211	1,743,239	3,068,019	3,762,787	5,091,000	5,751,000	5,924,000
Rumania	86,030	86,115	84,212	49,000	37,000	48,000	73,000	[2] 80,000	[2] 100,000	[2] 120,000
Southern Rhodesia	47,986	71,402	78,566	79,857	85,103	85,820	63,689	79,362	81,251	[2] 80,000
Spain	571,469	814,355	801,122	862,574	770,714	783,014	815,644	848,375	967,497	946,100
Sweden	112,107	[2] 100,000	81,617	32,175	----------	14,592	[2] 60,000	73,800	82,600	72,000
Taiwan (Formosa)	[2] 50,000	[2] 50,000	[2] 50,000	[2] 50,000	45,190	19,308	27,898	31,841	35,971	[2] 50,000
Turkey	85,348	178,114	182,974	208,623	227,290	262,153	265,437	270,483	293,312	308,000
Union of South Africa	163,315	232,498	240,724	176,524	208,147	225,879	238,398	363,512	[2] 360,000	[2] 400,000
U. S. S. R. (estimate)	20,700,000	7,285,000	8,301,000	11,000,000	13,000,000	14,500,000	17,000,000	20,000,000	24,000,000	27,000,000
United Kingdom [7]	13,031,396	15,138,701	14,684,421	14,307,360	14,210,198	14,137,567	14,036,677	15,670,336	15,739,630	15,640,000
United States	29,479,553	64,018,735	65,023,091	67,165,627	61,060,636	53,068,078	66,628,606	67,913,244	57,730,603	65,968,350
Total (estimate)	139,555,000	172,736,000	175,260,000	167,462,000	112,949,000	116,325,000	144,972,000	161,174,000	164,292,000	177,627,000

[1] Excludes gas-house coke.
[2] Estimate.
[3] Exports.
[4] Areas designated as Free China during the period of Japanese occupation.
[5] Includes Silesian production.
[6] Preliminary data for fiscal year ended Mar. 31 of year following that stated.
[7] In Great Britain production of gas-house coke is especially important: 10,770,130 tons in 1938, averaged 11,000,000 tons per year 1941–45, increased 15 percent in 1946–47, and 25–30 percent in 1948–49. Data for 1950 incomplete.

COAL-CHEMICAL MATERIALS

GENERAL SUMMARY

The vast postwar expansion of the chemicals industry has increased greatly the requirements of coal-chemical materials. Gas, ammonia, crude light oil, and tar are the basic coal-chemical materials, but the term also includes fractions and individual compounds that are recovered therefrom by a chain of industrial processes. The value of these materials to our defense program and civilian economy is difficult to estimate because the various coal products enter many fields and the finished product of one industry may become the raw material for another in the manufacture of a final commodity. Many new products that have increased the requirements of coal chemicals have been developed in the past 10 years. This, in turn, has caused the coke-plant operators to place more emphasis on processing the basic chemical raw materials in order to produce larger quantities of refined and pure aromatic hydrocarbon products.

Although many changes and improvements have been made in the construction and design of chemical recovery ovens proper that have increased the efficiency, economy, ease, and safety of operation of the ovens, there has been no radical change in the relative yield of the basic chemical raw materials. The high yields of tar, gas, ammonia, etc., that were attained in the mid-thirties cannot be compared with the current yields because of the difference in operating conditions of the ovens. However, relative yields were slightly lower in 1950 than in 1944 when ovens were also operated at maximum capacity.

Although markets for coal chemicals have been expanding, the proportion of revenue derived from their sale has not increased proportionately with the rise in coal costs or with the value credited to coke production. For example, the average cost of coal per ton of coke produced has increased 135 percent during the past 10 years, and the average value of coke produced has risen 179 percent, whereas the revenue from the sale of coal chemicals has increased 53 percent. The total revenue obtained from the sale of coal chemicals was equivalent to 23 percent of the total value of all products compared with 34 percent in 1940.

It is therefore evident that, in spite of the many improvements that have been made in recent years in the recovery and processing of the chemical raw materials (ammonia, tar, and crude light oil), these improvements have had little effect in reducing the cost of converting coal to coke. Surplus gas continues to rank second to coke as a source of revenue to coke-plant operators, a position it has maintained continuously since 1921. In 1950 surplus gas contributed 11 percent of the total value of all products (table 50). There was a change in the proportion of revenue contributed by the other coal-chemical materials, particularly ammonia and crude light oil and its derivatives. The decline in returns from the former was due to the marked decrease in the price of ammonium sulfate, while the gain in the light-oil group resulted from the substantial increase in the price of pure benzol. The possibility of higher coke oven returns through increased crude light oil and benzol yields appears limited, although the market position can be an important factor. The financial returns from tar

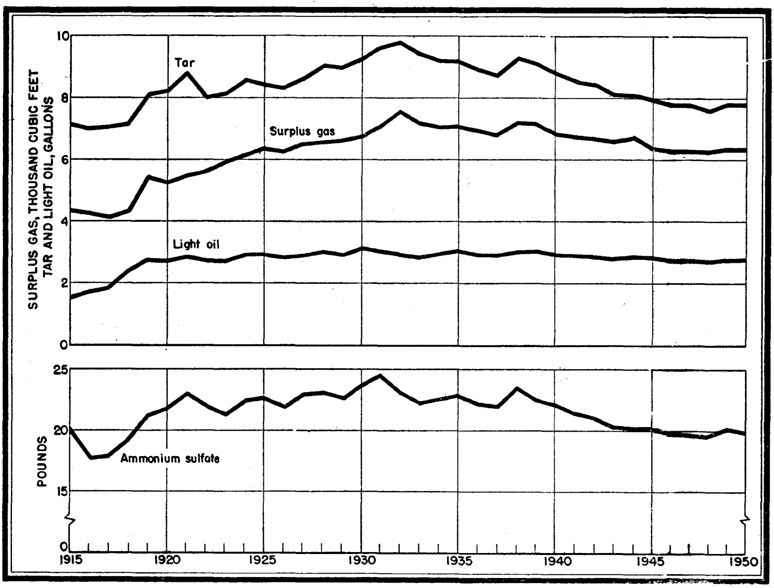

FIGURE 2.—Average yield of principal coal-chemical materials per net ton of coal carbonized in coke ovens, 1915–50. Yields of light oil and ammonium sulfate equivalent represent average for plants recovering these products.

and its derivatives which are credited to coke-oven operators have varied only slightly in recent years, because the greatest part of tar distillation in the United States is established as an independent industry. Tables 49 to 51 contain detailed statistics on the production and sales of the principal coal-chemical materials in 1950.

TABLE 49.—Coal-chemical materials obtained from coke-oven operations in the United States in 1950 [1]

[Exclusive of breeze]

Product	Production	Sales			On hand Dec. 31
		Quantity	Value		
			Total	Average	
Tar ....gallons..	739,868,767	435,245,843	$37,558,999	$0.086	30,138,144
Tar derivatives:					
Creosote oil, distillate as such..do....	25,444,498	25,389,681	3,972,531	.156	348,126
Creosote oil, in coal-tar solution gallons..	12,265,165	9,493,322	1,480,067	.156	586,019
Tar acid oil........do....	17,710,589	17,967,300	4,278,414	.238	540,737
Phenol........pounds..	7,939,303	7,942,406	947,147	.119	200,896
Pitch of tar:					
Soft [2]........net tons..	432,580	7,155	249,457	34.865	9,677
Hard [3]........do....	283,131	17,347	312,010	17.986	2,991
Other tar derivatives [4]........	....	....	1,076,198	....	....

For footnotes, see end of table.

TABLE 49.—Coal-chemical materials obtained from coke-oven operations in the United States in 1950 [1]—Continued

Product	Production	Sales: Quantity	Sales: Value: Total	Sales: Value: Average	On hand Dec. 31
Ammonia:					
Sulfate:					
From coke-oven ammonia pounds	1,662,032,906	1,682,331,655	$29,755,089	$0.018	115,377,093
From purchased synthetic ammonia pounds	29,397,962	29,497,962	661,817	.022	
Liquor (NH_3 content) do	46,773,669	43,162,889	1,567,499	.036	1,273,501
Total			[5] 31,322,588		
Sulfate equivalent of all forms [6] pounds	1,849,127,582	1,854,983,211			120,471,097
NH_3 equivalent of all forms [6] pounds	462,281,895	463,745,803			30,117,774
Gas:					
Used under boilers, etc. M cubic feet	[7] 979,592,988	35,856,065	4,440,208	.124	
Used in steel or allied plants do		378,271,394	65,091,633	.172	
Distributed through city mains M cubic feet		149,429,729	56,504,724	.378	
Sold for industrial use do		39,258,789	6,211,091	.158	
Total	[7] 979,592,988	602,815,977	132,247,656	.219	
Crude light oil gallons	[8] 260,856,875	19,663,139	2,873,773	.146	4,866,091
Light oil derivatives:					
Benzol:					
Motor do	7,727,349	7,588,602	1,437,199	.189	477,281
All other grades do	154,466,388	150,957,388	38,513,419	.255	5,459,041
Toluol, crude and refined do	30,664,831	30,417,947	7,319,842	.241	972,156
Xylol, crude and refined do	8,066,942	7,982,296	2,089,914	.262	487,453
Solvent naphtha do	6,002,849	5,785,188	1,133,502	.196	390,046
Other light-oil products do	6,818,021	4,096,921	451,814	.110	375,378
Total	213,746,380	206,828,342	50,945,690	.246	8,161,355
Intermediate light oil gallons	856,192	826,861	123,554	.149	58,177
Naphthalene, crude pounds	99,729,587	102,657,724	4,425,894	.043	4,242,254
Pyridine:					
Crude bases (dry basis) gallons	427,507	415,480	525,450	1.265	104,835
Refined or 2° C pounds	1,170,998	1,198,377	951,206	.794	28,820
Sodium phenolate gallons	2,743,047	2,617,982	413,567	.158	265,263
Sulfur pounds	5,858,015	7,554,535	116,172	.015	1,463,290
Other coal-chemical materials [9]			549,777		
Value of all coal-chemical materials sold			274,370,150		

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name.
[2] Softening point, less than 110° F. Includes some medium pitch-of-tar reported by 2 producers.
[3] Softening point, over 160° F.
[4] Cresols, cresylic acid, fuel oil, pitch coke, tar paint, and topped tar.
[5] Excludes value of sulfate from purchased synthetic ammonia.
[6] Excludes purchased synthetic ammonia.
[7] Includes gas used for heating ovens and gas wasted.
[8] 244,872,337 gallons refined by coke-oven operators to make derived products shown.
[9] Ammonium thiocyanate, picolines, secondary oil, and sodium prussiate.

TABLE 50.—Value of coal-chemical materials and of coke, including breeze, per ton of coke produced in the United States, 1937 and 1947–50

Product	1937	1947	1948	1949	1950
Ammonia and its compounds	$0.326	$0.423	$0.545	$0.558	$0.468
Light oil and its deriviatives (including naphthalene)	.435	[1] .567	[1] .686	.673	.871
Surplus gas sold or used	1.483	1.678	1.839	2.015	1.977
Tar sold	.375	.464	.614	.520	.562
Miscellaneous products	.066	.196	[1] .228	[1] .197	.224
Total	2.685	[1] 3.328	3.912	[1] 3,963	4.102
Tar used, not sold	.127	.141	[1] .213	.202	.129
Breeze produced	.162	.242	.293	.281	.277
Total	2.974	[1] 3.711	[1] 4.418	[1] 4.446	4.508
Value of coke produced	5.026	10.652	12.429	13.264	13.450
Total value of coke and coal-chemical materials	8.000	[1] 14.363	[1] 16.847	[1] 17.710	17.958

[1] Revised figure.

TABLE 51.—Coal equivalent of coal-chemical materials produced at oven-coke plants in the United States, 1913, 1914, 1918, 1937, and 1948–50

Year	Quantity of coal-chemical materials				Estimated equivalent in heating value (billion B. t. u.)					Coal equivalent	
	Coke breeze (thousand net tons)	Surplus gas (billion cubic feet)	Tar produced (thousand gallons)	Light oil produced (thousand gallons)	Coke breeze	Surplus gas	Tar	Light oil	Total	Net tons	Percent this forms of coal made into coke
1913	735	64	115,145	3,000	14,700	35,200	17,272	390	67,562	2,600,000	3.8
1914	667	61	109,901	8,464	13,340	33,550	16,485	1,100	64,475	2,461,000	4.8
1918	1,999	158	263,299	87,562	39,980	86,900	39,495	11,383	177,758	6,785,000	8.0
1937	3,884	463	603,053	187,054	77,680	254,650	90,458	24,317	447,105	17,065,000	22.9
1948	5,766	608	738,755	256,089	115,320	334,400	110,813	33,292	593,825	22,665,000	21.1
1949	4,929	546	672,407	228,754	98,582	300,300	100,861	29,738	529,481	20,209,000	22.1
1950	5,173	603	739,869	260,857	103,456	331,650	110,980	33,911	579,997	22,137,000	21.3

COKE-OVEN GAS

Approximately 17 percent by weight of the coal charged into slot-type ovens is recovered in the form of fuel gas. About one-third of the gas recovered is used to heat the coke ovens, and the remainder (surplus gas) is used in integrated metallurgical operations by neighboring industries or pumped through city mains for public consumption. The relative value of gas to coke-plant operators varies according to the type of operation. At coke plants integrated with iron and steel works, the bulk of the surplus gas is consumed within the works and assigned a low value, in accordance with established accounting procedures. Gas utilities and, to a large extent, the merchant plants market the largest proportion of their gas production through city mains for residential and commercial use, and for this a higher price is realized. Furnace plants used approximately 86 percent of their surplus gas within the plant as boiler fuel and in metallurgical furnaces and sold only 14 percent. Merchant plants, including the coke plants operated by gas utilities, consumed only 10 percent but sold 90 percent. Gas shown in table 54 as distributed through city mains is used principally for residential cooking and heating, although some of this gas is undoubtedly used for industrial purposes.

TABLE 52.—Coke-oven gas produced and sold in the United States in 1950, by States, in thousands of cubic feet

State	Active plants	Produced	Used in heating ovens	Surplus sold or used			Wasted
				Quantity	Value		
					Total	Average	
Alabama	7	83,718,280	38,688,323	43,179,421	$4,903,744	$0.114	1,850,536
California	1	9,371,345	551,882	8,344,609	(1)	(1)	474,854
Colorado	1	13,728,606	6,728,480	6,822,511	(1)	(1)	177,615
Illinois	8	51,342,881	17,201,054	33,440,557	5,605,825	.167	701,270
Indiana	5	108,379,784	46,094,604	61,780,727	16,363,219	.265	504,453
Maryland	1	35,979,976	10,553,108	23,996,451	(1)	(1)	1,430,417
Massachusetts	1	12,900,523	2,045,915	10,854,608	(1)	(1)	----------
Michigan	4	37,484,448	5,513,296	31,962,456	4,778,531	.150	8,696
Minnesota	3	12,924,088	5,831,204	6,856,091	1,652,906	.241	236,793
New Jersey	2	22,594,703	6,114,983	16,479,720	(1)	(1)	----------
New York	8	84,397,004	23,758,003	59,754,490	21,667,849	.363	884,511
Ohio	15	146,239,348	63,711,613	79,669,238	14,140,744	.177	2,858,497
Pennsylvania	13	243,018,157	100,821,005	140,986,203	28,026,598	.199	1,210,949
Tennessee	1	3,065,948	1,279,245	1,750,562	(1)	(1)	36,141
Texas	2	10,384,535	4,070,844	4,901,230	(1)	(1)	1,412,461
Utah	2	20,902,834	5,223,686	13,370,314	(1)	(1)	2,308,834
West Virginia	5	52,678,078	14,119,053	36,509,520	5,640,158	.154	2,049,505
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	6	30,482,450	8,277,256	22,157,269	6,859,919	.310	47,925
Undistributed	-------	----------	----------	----------	22,608,163	.261	----------
Total 1950	85	979,592,988	360,583,554	602,815,977	132,247,656	.219	16,193,457
At merchant plants	30	180,364,316	44,633,277	133,965,463	50,124,488	.374	1,765,576
At furnace plants	55	799,228,672	315,950,277	468,850,514	82,123,168	.175	14,427,881
Total 1949	86	882,309,827	324,432,415	546,148,968	121,378,832	.222	11,728,444

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 53.—Coke-oven gas and other kinds of gas used in heating ovens in 1950, by States, in thousands of cubic feet [1]

State	Coke-oven gas	Producer gas	Blue-water gas	Blast-furnace gas	Other gases [2]	Total coke-oven gas equivalent
Alabama	38,688,323	----------	----------	----------	442,613	39,130,936
California	551,882	----------	----------	3,124,078	----------	3,675,960
Colorado	6,728,480	----------	----------	----------	----------	6,728,480
Illinois	17,201,054	----------	----------	4,718,030	3,055,345	24,974,429
Indiana	46,094,604	1,263,565	504,163	2,251,324	145,455	50,259,111
Maryland	10,553,108	----------	----------	4,073,390	----------	14,626,498
Massachusetts	2,045,915	3,772,562	----------	----------	----------	5,818,477
Michigan	5,513,296	----------	----------	7,900,770	----------	13,414,066
Minnesota	5,831,204	----------	202,254	----------	30,359	6,063,817
New Jersey	6,114,983	3,475,800	----------	----------	----------	9,590,783
New York	23,758,003	10,822,761	1,233,689	430,129	200,128	36,444,710
Ohio	63,711,613	----------	----------	1,943,394	72,317	65,727,324
Pennsylvania	100,821,005	1,665,356	----------	3,528,456	653,337	106,668,154
Tennessee	1,279,245	----------	----------	----------	----------	1,279,245
Texas	4,070,844	----------	----------	----------	----------	4,070,844
Utah	5,223,686	----------	----------	3,386,879	----------	8,610,565
West Virginia	14,119,053	----------	----------	5,532,583	852,313	20,503,949
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	8,277,256	4,298,125	----------	----------	397,253	12,972,634
Total	360,583,554	25,298,169	1,940,106	36,889,033	5,849,120	430,559,982
At merchant plants	44,633,277	25,016,298	1,737,852	----------	5,303,181	76,690,608
At furnace plants	315,950,277	281,871	202,254	36,889,033	545,939	353,869,374

[1] Adjusted to an equivalent of 550 B.t.u. per cubic foot.
[2] Natural, oil, spillage, and liquefied petroleum (LP-) gases.

TABLE 54.—Disposal of surplus coke-oven gas in the United States in 1950, by States, in thousands of cubic feet

State	Used by producer—						Sold					
	Under boilers			In steel or allied plants			Distributed through city mains			For industrial purposes		
	Quantity	Value		Quantity	Value		Quantity	Value		Quantity	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
Alabama	9, 304, 243	$1, 008, 745	$0. 108	26, 677, 877	$3, 148, 608	$0. 118	5, 880, 080	$624, 212	$0. 106	1, 317, 221	(1)	(1)
California	50, 004	(1)	(1)	8, 294, 605	(1)	(1)	----------	----------	----------	----------	----------	----------
Colorado	----------	----------	----------	6, 822, 511	(1)	(1)	----------	----------	----------	----------	----------	----------
Illinois	5, 507, 859	668, 382	. 121	7, 118, 218	(1)	(1)	20, 122, 531	3, 361, 698	. 167	691, 949	(1)	(1)
Indiana	2, 728, 644	(1)	(1)	45, 224, 975	9, 688, 186	. 214	8, 114, 736	4, 616, 086	. 569	5, 712, 372	(1)	(1)
Maryland	----------	----------	----------	21, 003, 977	(1)	(1)	2, 992, 474	(1)	(1)	----------	----------	----------
Massachusetts	730	(1)	(1)	----------	----------	----------	10, 853, 878	(1)	(1)	----------	----------	----------
Michigan	1, 351, 875	(1)	(1)	28, 729, 732	4, 207, 691	. 146	----------	----------	----------	1, 880, 849	(1)	(1)
Minnesota	207, 506	12, 360	. 060	2, 843, 361	(1)	(1)	2, 373, 810	(1)	(1)	1, 431, 414	(1)	(1)
New Jersey	----------	----------	----------	281	(1)	(1)	16, 479, 439	(1)	(1)	----------	----------	----------
New York	1, 208, 625	(1)	(1)	19, 629, 831	(1)	(1)	38, 381, 884	17, 200, 227	. 448	534, 150	$232, 034	$0. 434
Ohio	4, 145, 333	690, 941	. 167	60, 019, 976	10, 696, 821	. 178	3, 355, 581	896, 905	. 267	12, 148, 348	1, 856, 077	. 153
Pennsylvania	4, 200, 707	(1)	(1)	104, 587, 924	17, 677, 286	. 169	23, 914, 971	8, 684, 957	. 363	8, 282, 601	(1)	(1)
Tennessee	418, 199	(1)	(1)	----------	----------	----------	1, 332, 363	(1)	(1)	----------	----------	----------
Texas	3, 388, 199	(1)	(1)	1, 502, 731	(1)	(1)	----------	----------	----------	10, 300	(1)	(1)
Utah	21, 595	(1)	(1)	12, 974, 107	(1)	(1)	----------	----------	----------	374, 612	(1)	(1)
West Virginia	1, 524, 660	(1)	(1)	32, 841, 288	5, 223, 902	. 159	----------	----------	----------	2, 143, 572	(1)	(1)
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	1, 797, 886	290, 009	. 161	----------	----------	----------	15, 627, 982	6, 139, 894	. 393	4, 731, 401	430, 016	. 091
Undistributed	----------	1, 769, 771	. 119	----------	14, 449, 139	. 180	----------	14, 980, 745	. 440	----------	3, 692, 964	. 169
Total 1950	35, 856, 065	4, 440, 208	. 124	378, 271, 394	65, 091, 633	. 172	149, 429, 729	56, 504, 724	. 378	39, 258, 789	6, 211, 091	. 158
At merchant plants	6, 131, 166	640, 920	. 105	6, 794, 682	1, 488, 564	. 219	102, 582, 592	45, 136, 943	. 440	18, 457, 023	2, 858, 061	. 155
At furnace plants	29, 724, 899	3, 799, 288	. 128	371, 476, 712	63, 603, 069	. 171	46, 847, 137	11, 367, 781	. 243	20, 801, 766	3, 353, 030	. 161
Total 1949	27, 459, 095	3, 946, 741	. 144	329, 560, 954	55, 220, 339	. 168	154, 994, 365	57, 087, 966	. 368	34, 134, 554	5, 123, 786	. 150

(1) Included with "Undistributed" to avoid disclosure of individual company operations.

CRUDE COAL TAR AND DERIVATIVES

Crude tar represents 4 to 5 percent of the weight and 5 to 8 percent of the heat of the original coal from which it is made. The yield of tar varies greatly from plant to plant, depending on the kind of coal used, the temperature of oven operation, the completeness of tar recovery, and other factors. In modern plants, the yield of tar ranges from 6 to 10 gallons per ton of coal carbonized. The principal uses of tar are (1) as raw material for the manufacture of numerous organic chemicals and (2) as fuel. Refining or processing of crude coal tar is increasing in importance because of the rising demand of the synthetic chemicals industry. Coke-oven operators processed 27 percent of their production in 1950 and sold 55 percent to tar distillers. The quantity of tar burned dropped 30 percent from 1949 and represented only 13 percent of the production compared with 21 percent in 1949. The proportion of tar that is burned varies according to availability and price of fuel oil. When the price of fuel oil is high, the furnace-coke plants find it advantageous to burn larger quantities of tar. Unlike the majority of the iron and steel plants, which can burn the tar or sell it according to business and economic conditions, the merchant plants must market their production. It is of interest to note that the average unit value of the tar sold by furnace plants was over 1 cent per gallon higher than for the merchants. Coke-oven tar comprises about 80 percent of the tar refined in the United States; the remainder is made up of low-temperature coal tar, retort coal tar, water-gas tar, and oil-gas tar.

Coke-plant operators processed in integrated facilities 27 percent of the total tar output in 1950. The Bureau of Mines does not collect statistics on the production of tar derivatives made in tar-distilling plants operated independently of the coke-oven operations. Statistics on these tar plants are collected, compiled, and published by the United States Tariff Commission. The principal commercial tar products produced by coke-oven operators are creosote oil and tar-acid oil. About one-fifth of the total production of creosote oil in the United States comes from these plants. Creosote oil, used mainly for wood preservation, usually yields about 40 to 50 percent of the total revenue obtained by coke-oven operators from the sale of tar derivatives. The market for creosote oil improved in 1950, and the prices received by coke-oven operators increased slightly over 1949. Tar-acid-oil production increased 45 percent over the 1949 figure, principally because of the gain in quantity of tar processed. Tar-acid oil is a crude mixture of phenol, cresols, cresylic acid, xylenols, etc. These tar acids can be extracted with alkali from the tar-acid oil fraction for the manufacture of phenolic plastics, glues, disinfectants, and a host of other materials, or the tar-acid oil may be used for working up low-grade ores to concentrate the desired mineral. Details on the production of cresols, cresylic acid, anthracene, and other derivatives cannot be disclosed, as fewer than three producers reported these products to the Bureau. Pitch, the residue left when tar is topped or refined, is not marketed extensively in the coke industry and is used mainly as fuel. The soft- or medium-melting-point pitches are cut back (usually with virgin tar) to the desired viscosity

TABLE 55.—Coke-oven tar produced, used by producer, and sold in the United States in 1950, by States, in gallons

State	Produced		Used by producer—				Sold—					On hand Dec. 31
									Total			
	Total	Per ton of coal coked	For refining or topping	As fuel under boilers	In open hearth or allied plants	Otherwise	For use as fuel [1]	For refining into tar products	Quantity	Value: Total	Value: Average	
Alabama	63, 853, 113	7. 77	1, 428, 585	1, 193, 334	19, 198, 894	105, 705	------	42, 223, 824	42, 223, 824	$3, 829, 714	$0. 091	1, 646, 795
California	8, 458, 058	9. 99	8, 274, 892	------	------	------	------	9, 484	9, 484	(2)	(2)	331, 052
Colorado	10, 994, 299	9. 30	10, 578, 690	------	------	14, 710	------	5, 000	5, 000	(2)	(2)	512, 094
Illinois	34, 550, 382	6. 74	3, 136, 440	474, 601	------	845, 481	------	29, 893, 517	29, 893, 517	2, 630, 731	. 088	1, 218, 664
Indiana	65, 057, 395	5. 81	11, 199, 518	------	1, 061, 421	1, 345, 989	------	50, 134, 836	50, 134, 836	4, 613, 652	. 092	3, 921, 914
Maryland	25, 936, 710	7. 86	------	------	3, 967, 267	------	------	22, 235, 953	22, 235, 953	(2)	(2)	1, 912, 713
Massachusetts	9, 250, 476	7. 75	------	------	------	11, 301	------	9, 494, 587	9, 494, 587	(2)	(2)	149, 015
Michigan	25, 257, 568	6. 79	------	338, 665	------	110	------	24, 774, 740	24, 774, 740	2, 124, 530	. 086	1, 266, 239
Minnesota	7, 739, 066	6. 75	------	------	3, 197, 036	------	------	4, 318, 934	4, 318, 934	(2)	(2)	724, 850
New Jersey	16, 664, 945	8. 08	------	------	------	------	------	16, 473, 965	16, 473, 965	(2)	(2)	559, 380
New York	62, 104, 822	7. 88	18, 574, 760	49, 300	------	1, 331	1, 186, 328	43, 699, 168	44, 885, 496	3, 574, 258	. 080	2, 234, 680
Ohio	104, 112, 299	7. 09	1, 543, 715	476, 768	30, 394, 316	213, 375	7, 657, 544	64, 258, 047	71, 915, 591	6, 691, 122	. 093	4, 065, 513
Pennsylvania	212, 657, 381	8. 99	148, 583, 438	80, 165	29, 798, 920	284, 611	64, 200	34, 869, 780	34, 933, 980	2, 765, 105	. 079	7, 389, 799
Tennessee	2, 383, 092	7. 17	------	------	------	------	------	2, 377, 021	2, 377, 021	(2)	(2)	37, 213
Texas	6, 314, 484	6. 57	------	------	------	4, 000	------	6, 225, 089	6, 225, 089	(2)	(2)	397, 348
Utah	19, 138, 562	10. 76	------	------	7, 662, 199	------	------	10, 682, 732	10, 682, 732	(2)	(2)	1, 430, 112
West Virginia	44, 067, 408	9. 23	------	------	------	------	22, 409, 514	20, 936, 646	43, 346, 160	4, 109, 987	. 095	1, 517, 488
Connecticut, Kentucky, Missouri, Rhode Island, and Wisconsin	21, 328, 707	7. 44	------	------	------	15, 430	------	21, 314, 934	21, 314, 934	1, 699, 799	. 080	823, 275
Undistributed	------	------	------	------	------	------	------	------	------	5, 520, 101	. 077	------
Total 1950	739, 868, 767	7. 79	203, 320, 038	2, 612, 833	95, 280, 053	2, 842, 043	31, 317, 586	403, 928, 257	435, 245, 843	37, 558, 999	. 086	30, 138, 144
At merchant plants	135, 746, 333	7. 88	1, 428, 585	49, 300	------	28, 062	------	134, 482, 955	134, 482, 955	10, 572, 932	. 079	4, 517, 070
At furnace plants	604, 122, 434	7. 78	201, 891, 453	2, 563, 533	95, 280, 053	2, 813, 981	31, 317, 586	269, 445, 302	300, 762, 888	26, 986, 067	. 090	25, 621, 074
Total 1949	672, 407, 370	7. 81	166, 668, 961	2, 743, 538	137, 617, 471	2, 348, 109	27, 520, 030	338, 904, 681	366, 424, 711	31, 314, 137	. 085	29, 570, 187

[1] Comprises 27,306,627 gallons sold to affiliated companies and 4,010,959 gallons sold to other purchasers.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

and used as fuel in metallurgical furnaces. The hard pitch made at several plants is pulverized and mixed with the coal before charging into ovens to improve the coke quality.

CRUDE LIGHT OIL AND DERIVATIVES

Crude light oil is the basic chemical raw material from which benzol, toluol, xylol, etc., are made. The tremendous increase in requirements of benzol for styrene, phenol, nylon, etc., in the past several years and particularly since the outbreak of hostilities in Korea have emphasized the importance of crude light oil to our defense program and civilian economy. Crude light oil yields roughly 65 percent benzol when it is fractionally distilled. The potential yield of crude light oil per ton of coal carbonized varies widely from plant to plant, depending on the quality and kind of coal charged, the design and condition of ovens, oven temperatures, and the kind of scrubbing equipment. In 1950 the yield of crude light oil ranged from 1.09 to 4.50 gallons per ton and averaged 2.81 compared with 2.77 in 1949. This wide range in recovery is clearly indicative that many plants can increase light-oil production by improving scrubbing facilities. In an effort to determine how much additional light oil and benzol could be obtained, the Defense Solid Fuels Administration started a survey of all coke plants in the fall of 1950. The survey indicated that benzol production might be increased about 10 percent by installing more modern scrubbing equipment at inefficient plants.

In 1950 production of chemical grades of benzol in the United States totaled about 186,000,000 gallons, including 10,000,000 gallons from petroleum. In addition, about 23,000,000 gallons of crude benzol was imported to meet essential requirements. Estimates by various industry and Government representatives on requirements over the next several years indicate that the gap between requirements and coke-oven benzol will widen, because benzol output from coal is limited generally by coke requirements, which, in turn, are governed by pig-iron production. Therefore, in the fall of 1950, the Government requested the petroleum industry to build facilities as rapidly as possible to produce about 100,000,000 gallons annually.

Toluol is another light-oil derivative that has many important applications in the chemical field. Toluol is used extensively as a solvent, particularly in the manufacture of synthetic plastics; it is also used for synthesizing a number of other chemicals, such as benzoic acid. In wartime its importance is derived from its use in manufacturing explosives and also for enriching aviation gasoline. Unlike benzol, which in the past has been largely made from coal, large-scale production of toluol from petroleum was begun during World War II. In 1950 coke-oven operators produced about 37 percent of the total national output of toluol. Xylol is another aromatic material that is being made from petroleum in increasing quantities. Coke-plant operators produced only 11 percent of the total in 1950. Prices on all of the derivatives increased in 1950, with the chemical grade of benzol showing the largest gain, advancing $0.057 per gallon (29 percent) over the average unit price in 1949.

TABLE 56.—Coke-oven crude light oil produced in the United States and derived products obtained and sold in 1950, by States, in gallons

State	Active plants	Produced: Total	Produced: Per ton of coal coked	Refined on premises [1]	Derived products: Produced	Derived products: Sold [2]: Quantity	Derived products: Sold [2]: Value	On hand Dec. 31
Alabama	7	22,450,098	2.73	22,019,775	19,220,142	18,217,066	$4,424,181	372,858
California	1	2,750,757	3.25	2,622,901	2,298,335	2,074,963	(3)	15,566
Colorado	1	3,418,881	2.89	3,429,020	3,132,669	3,010,545	(3)	51,849
Illinois	7	12,312,466	2.44	8,253,715	7,299,868	7,228,669	1,761,019	318,178
Indiana	5	25,494,747	2.45	26,509,846	24,105,086	23,175,928	5,799,481	395,885
Maryland	1	13,459,881	4.08	13,310,475	11,698,403	11,365,943	(3)	304,397
Michigan	4	9,354,544	2.51	6,268,210	5,583,809	5,093,794	1,293,038	252,588
New York	8	20,976,873	2.66	26,757,688	24,362,485	24,105,925	5,969,220	440,560
Ohio	15	41,479,588	2.82	37,234,832	29,936,372	29,755,562	7,342,285	789,753
Pennsylvania	13	73,069,194	3.09	71,612,896	63,478,547	62,025,176	15,130,258	1,137,366
Tennessee	1	884,186	2.66	925,028	835,701	132,768	(3)	14,951
Texas	2	2,320,000	2.41	2,320,000	2,046,234	2,026,268	(3)	------
Utah	2	6,988,162	3.93	7,007,934	5,576,972	5,676,800	(3)	83,434
West Virginia	5	14,945,844	3.13	13,944,146	11,871,058	10,699,348	2,678,668	64,484
Connecticut, Kentucky, Massachusetts, Minnesota, Missouri, New Jersey, and Wisconsin	8	10,951,654	1.84	2,655,871	2,300,699	2,239,587	535,799	624,222
Undistributed	------	------	------	------	------	------	6,011,741	------
Total 1950	80	260,856,875	2.81	244,872,337	213,746,380	206,828,342	50,945,690	4,866,091
At merchant plants	27	35,848,156	2.24	25,272,588	22,521,279	20,605,721	4,794,727	1,728,791
At furnace plants	53	225,008,719	2.93	219,599,749	191,225,101	186,222,621	46,150,963	3,137,300
Total 1949	78	228,754,333	2.77	220,888,075	190,720,203	188,026,750	36,251,767	3,826,701

[1] Comprises 239,045,717 gallons of crude light oil from own production and 5,827,620 gallons purchased from other coke plants.
[2] Excludes 19,663,139 gallons of crude light oil valued at $2,873,773 sold as such.
[3] Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 57.—Trend in yields of products obtained from refining crude light oil at oven-coke plants, 1937 and 1941–50, in percent

Year	Benzol: Motor	Benzol: All other grades	Toluol, crude and refined	Xylol, crude and refined	Solvent naphtha	Other light-oil products
1937	52.5	11.9	11.5	2.5	3.1	4.5
1941	47.2	16.8	13.0	3.4	2.3	3.6
1942	26.8	35.3	13.4	3.9	2.2	3.8
1943	8.6	53.9	13.1	3.6	2.1	3.6
1944	7.1	56.6	12.9	3.3	2.1	3.5
1945	12.3	53.9	11.5	3.2	2.0	3.3
1946	13.8	55.3	8.3	3.0	2.2	3.8
1947	6.5	60.1	10.9	3.0	2.3	3.5
1948	3.7	61.7	11.7	3.0	2.4	3.3
1949	9.5	55.6	12.5	3.3	2.3	3.2
1950	3.2	63.1	12.5	3.3	2.5	2.8

TABLE 58.—Production of benzol and toluol, by grades, at oven-coke plants, 1941–50, in gallons

Year	Benzol				Toluol		
	Motor	Nitration or 1° C.	Pure commercial or 2° C.	All other	Nitration or 1° C.	Pure commercial or 2° C.	All other
1941	106,372,000	15,414,500	18,286,400	4,182,600	14,689,800	13,268,500	1,378,900
1942	64,797,600	25,624,400	53,617,900	6,014,700	25,160,200	5,044,800	2,109,600
1943	21,267,900	35,047,800	93,246,600	4,144,800	27,152,300	2,394,700	2,725,600
1944	18,556,600	41,285,800	102,436,500	3,187,600	29,771,100	2,149,600	1,607,500
1945	28,788,100	39,166,500	86,237,300	1,266,700	23,355,400	2,219,700	1,494,200
1946	27,398,900	35,739,300	71,681,700	2,308,000	12,518,000	2,796,400	1,205,400
1947	15,802,700	42,475,300	100,111,800	2,470,800	20,514,100	4,989,500	892,800
1948	9,014,300	43,541,200	103,356,300	3,101,400	22,899,700	5,280,800	267,800
1949	20,923,700	28,988,700	91,717,300	2,035,600	20,808,300	6,317,200	545,100
1950	7,727,300	41,324,900	110,114,300	3,027,200	22,108,600	7,785,800	770,400

NAPHTHALENE

TABLE 59.—Crude napththalene produced and sold by coke-plant operators in the United States, 1937 and 1945–50

Year	Produced (pounds)	Sold			
		Pounds	Value		
			Total	Average per pound	Average per ton of oven coke
1937	60,797,108	60,315,581	$1,182,992	$0.020	$0.024
1945	87,677,299	86,936,517	1,806,967	.021	.029
1946	71,605,138	[1] 71,783,705	[1] 1,602,359	.022	.030
1947	[1] 98,654,485	[1] 95,315,607	[1] 3,128,389	[1] .033	[1] .047
1948	[1] 103,431,811	[1] 100,442,631	[1] 4,619,374	[1] .046	[1] .068
1949	70,823,436	[1] 56,643,829	2,654,815	[1] .047	.044
1950	99,729,587	102,657,724	4,425,894	.043	.066

[1] Revised figure.

COKE-OVEN AMMONIA

Ammonia is recovered at coke plants, either as its water solution (ammonia liquor) or as a crystallized ammonium sulfate. In 1950, 79 of the 85 active plants recovered ammonia; 64 made ammonium sulfate and 17 ammonia liquor (2 plants produced both sulfate and liquor). Purchased synthetic ammonia was converted into sulfate at four coke plants during the first half of 1950. Usually, 85 to 90 percent of the ammonia recovered from the ovens is converted into sulfate. Coke-oven sulfate is used almost exclusively for agricultural purposes. The merchant coke plants, however, recover a larger proportion of the ammonia in the form of ammonia liquor, and this group of plants produced over 60 percent of the total output. Ammonia liquor produced by coke-plant operators is used for both chemical and agricultural purposes. Although precise data are not available on the quantity of ammonia liquor used for each category, it is estimated that over half is used industrially in manufacturing soda ash, ammonium chloride, and sulfuric acid. Until recent years coke ovens furnished the bulk of the ammonium sulfate consumed in the United States. However, in the past several years a few of the large synthetic ammonia producers have constructed plants to produce ammonium sulfate; as a result, production of synthetic sulfate exceeds that of coke-oven sulfate. Shipments of sulfate exceeded production in 1950, indicating a large demand. Prices, however, dropped sharply, falling from $0.023 per pound in 1949 to $0.018.

TABLE 60.—Coke-oven ammonia produced and sold in the United States in 1950, by States, in pounds

State	Active plants	Produced				Sold as—				On hand Dec. 31	
		Sulfate equivalent	Per ton of coal coked	As sulfate	As liquor (NH_3 content)	Sulfate: Quantity	Sulfate: Value	Liquor (NH_3 content): Quantity	Liquor (NH_3 content): Value	Sulfate	Liquor (NH_3 content)
Alabama	7	187,560,954	22.75	179,924,022	1,909,233	178,208,582	$3,445,629	1,953,723	(1)	8,973,935	13,012
California	1	21,863,688	25.84	21,863,688	----	22,051,320	(1)	----	----	332,802	----
Colorado	1	26,410,000	22.35	26,410,000	----	24,812,276	(1)	----	----	5,890,989	----
Illinois	6	85,687,928	19.05	85,687,928	----	83,531,854	1,480,260	----	----	5,556,931	----
Indiana	5	186,762,547	16.67	161,939,211	6,205,834	171,971,173	3,022,719	6,219,863	$217,941	21,749,188	229,301
Maryland	1	68,621,310	20.79	68,621,310	----	68,625,600	(1)	----	----	2,569,174	----
Massachusetts	1	21,720,820	18.19	21,720,820	----	21,955,800	(1)	----	----	1,088,880	----
Michigan	4	71,302,404	19.16	24,829,804	11,618,150	25,394,287	(1)	9,339,605	(1)	2,844,470	312,418
Minnesota	3	19,572,400	17.08	19,572,400	----	21,492,276	407,265	----	----	1,323,621	----
New Jersey	2	39,775,455	19.29	39,775,455	----	40,103,550	(1)	----	----	2,122,400	----
New York	8	153,408,563	19.47	130,098,255	5,827,577	130,159,580	2,196,078	5,358,804	197,500	5,980,520	222,619
Ohio	15	269,073,550	18.31	218,658,134	12,603,854	219,511,751	3,740,118	11,444,898	387,306	15,370,143	326,694
Pennsylvania	13	494,668,715	20.92	492,307,363	590,338	502,865,931	8,100,693	610,320	(1)	33,417,163	30,660
Tennessee	1	6,729,629	20.24	6,729,629	----	7,069,340	(1)	----	----	189,254	----
Texas	2	20,627,130	21.46	20,627,130	----	20,498,989	(1)	----	----	906,019	----
Utah	2	46,081,030	25.90	46,081,030	----	48,799,211	(1)	----	----	1,419,940	----
West Virginia	3	78,547,899	20.65	78,547,899	----	77,879,695	1,230,830	----	----	4,160,269	----
Connecticut, Kentucky, Missouri, and Wisconsin	4	50,713,560	20.40	18,638,828	8,018,683	17,400,440	395,436	8,235,676	290,754	1,481,395	138,797
Undistributed	----	----	----	----	----	----	5,736,061	----	473,998	----	----
Total 1950	79	1,849,127,582	19.89	1,662,032,906	46,773,669	1,682,331,655	29,755,089	43,162,889	1,567,499	115,377,093	1,273,501
At merchant plants	25	318,533,839	20.16	200,882,879	29,412,740	199,762,580	3,772,430	32,502,727	1,173,597	12,440,333	934,885
At furnace plants	54	1,530,593,743	19.83	1,461,150,027	17,360,929	1,482,569,075	25,982,659	10,660,162	393,902	102,936,760	338,616
Total 1949	80	1,695,611,937	20.08	1,513,613,773	45,499,541	1,421,187,308	31,990,441	40,582,835	1,600,103	138,777,619	1,707,984

[1] Included with "Undistributed" to avoid disclosure of individual company operations.

COKE OVENS OWNED BY CITY GAS COMPANIES (PUBLIC UTILITIES)

Table 61 compares the activities of coke plants operated by gas utilities with those not owned by city gas companies for 1949 and 1950. This classification is maintained by the Bureau of Mines in the interest of those who may wish to follow coal carbonizing at public utility plants and also to show their relative position in the coke industry as a whole.

Normally, maximum production of gas of proper analysis is the primary objective of these plants; however, the extremely heavy demand for industrial coke during and since World War II has caused many operators to place a greater emphasis on coke, and in 1950 over a million tons of metallurgical coke from this group was shipped to iron blast furnaces and foundry cupolas. Although the volume of coke production has not decreased markedly in recent years, the number of operators has been declining steadily because of substitution of natural gas for coke-oven gas in certain areas. In 1950 the Wisconsin Public Service Co., Sheboygan, Wis., discontinued operating its oven-coke plant, leaving but 11 city gas coke plants in operation at the end of the year. Several other companies are planning to substitute natural gas for coke-oven gas in 1951 and will close their coke plants unless they can be disposed of to other interests. Economical operation of a coke plant requires a properly balanced market under favorable conditions for all products, since the production of any one is almost invariably accompanied by the production of all the others. Therefore, loss of a market for coke-oven gas makes it difficult for a city gas plant to operate economically. Revenue from sales of surplus coke-oven gas from these plants accounts for 26 percent of the total revenue obtained from all products. City gas plants in 1950 contributed 6 percent of the total production of oven coke, gas, and tar, 3 percent of the crude light oil, and 5 percent of the ammonia.

TABLE 61.—Production of coke, breeze, and coal-chemical materials in the United States at oven-coke plants owned by city gas companies (public utilities) [1] compared with all other oven-coke plants, 1949–50

Product	1949			1950		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
Number of active plants	73	13	86	73	12	85
Coke:						
Production net tons	56, 574, 488	3, 647, 993	60, 222, 481	63, 071, 875	3, 818, 743	66, 890, 618
Value	$742, 989, 908	$55, 802, 161	$798, 792, 069	$840, 692, 718	$58, 974, 609	$899, 667, 327
Average per ton	$13.13	$15.30	$13.26	$13.33	$15.44	$13.45
Breeze:						
Production net tons	4, 548, 977	380, 109	4, 929, 086	4, 815, 363	357, 395	5, 172, 758
Sales do	1, 029, 718	25, 741	1, 055, 459	1, 388, 594	18, 447	1, 407, 041
Value of sales	$4, 010, 520	$95, 494	$4, 106, 014	$5, 445, 665	$68, 744	$5, 514, 409
Average per ton	$3.89	$3.71	$3.89	$3.92	$3.73	$3.92
Coal charged into ovens:						
Bituminous net tons	80, 669, 066	5, 212, 510	85, 881. 576	89, 316, 805	5, 440, 230	94, 757, 035
Anthracite do	141, 206	31, 619	172, 825	137, 797	31, 478	169, 275
Total do	80, 810, 272	5, 244, 129	86, 054, 401	89, 454, 602	5, 471, 708	94, 926, 310
Value	$680, 734, 929	$52, 611, 679	$733, 346, 608	$767, 420, 831	$55, 165, 485	$822, 586, 316
Average per ton	$8.42	$10.03	$8.52	$8.58	$10.08	$8.67

For footnotes, see end of table.

TABLE 61.—Production of coke, breeze, and coal-chemical materials in the United States at oven-coke plants owned by city gas companies (public utilities)[1] compared with all other oven-coke plants, 1949–50—Continued

Product	1949			1950		
	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total	Plants not owned by city gas companies	Plants owned by city gas companies (public utilities)	Total
Coke—						
Used by producer:						
Net tons	36,211,133	1,376,648	37,587,781	41,888,637	1,522,349	43,410,986
Value	$464,324,758	$18,467,571	$482,792,329	$541,587,521	$20,110,494	$561,698,015
Sold:						
Net tons	20,248,133	2,233,340	22,481,473	21,645,617	2,454,902	24,100,519
Value	$276,648,096	$36,848,968	$313,497,064	$306,065,821	$41,096,836	$347,162,657
Coal-chemical materials:						
Tar:						
Production gallons	629,182,418	43,224,952	672,407,370	694,028,547	45,840,220	739,868,767
Sales do	322,473,638	43,951,073	366,424,711	389,468,646	45,777,197	435,245,843
Value of sales	$27,316,496	$3,997,641	$31,314,137	$33,895,971	$3,663,028	$37,558,999
Ammonia:						
Production (NH_3 equivalent of all forms) pounds	401,245,708	22,657,276	423,902,984	438,832,283	23,449,612	462,281,895
Liquor (NH_3 content):						
Production pounds	43,185,514	2,314,027	45,499,541	44,734,763	2,038,906	46,773,669
Sales do	38,950,265	1,632,570	40,582,835	41,603,060	1,559,829	43,162,889
Value of sales	$1,548,842	$51,261	$1,600,103	$1,516,954	$50,545	$1,567,499
Sulfate:						
Production pounds	1,432,240,776	81,372,997	1,513,613,773	1,576,390,082	85,642,824	1,662,032,906
Sales do	1,343,240,303	77,947,005	1,421,187,308	1,598,907,955	83,423,700	1,682,331,655
Value of sales	$30,214,894	$1,775,547	$31,990,441	$28,185,891	$1,569,198	$29,755,089
Gas:						
Production M cubic feet	825,080,212	57,229,615	882,309,827	919,264,582	60,328,406	979,592,988
Disposal of surplus:						
Used under boilers:						
M cubic feet	27,133,800	325,295	27,459,095	35,152,385	703,680	35,856,065
Value	$3,893,550	$53,191	$3,946,741	$4,327,619	$112,589	$4,440,208
Average per M cubic feet	$0.143	$0.164	$0.144	$0.123	$0.160	$0.124
Used in steel or allied plants:						
M cubic feet	329,557,820	3,134	329,560,954	378,268,133	3,261	378,271,394
Value	$55,218,490	$1,849	$55,220,339	$65,089,728	$1,905	$65,091,633
Average per M cubic feet	$0.168	$0.590	$0.168	$0.172	$0.584	$0.172
Distributed through city mains:						
M cubic feet	103,792,212	51,202,153	154,994,365	96,912,152	52,517,577	149,429,729
Value	$34,467,932	$22,620,034	$57,087,966	$33,334,247	$23,170,477	$56,504,724
Average per M cubic feet	$0.332	$0.442	$0.368	$0.344	$0.441	$0.378
Sold for industrial use:						
M cubic feet	32,406,477	1,728,077	34,134,554	37,421,513	1,837,276	39,258,789
Value	$4,333,678	$790,108	$5,123,786	$5,382,212	$828,879	$6,211,091
Average per M cubic feet	$0.134	$0.457	$0.150	$0.144	$0.451	$0.158
Crude light oil:						
Production gallons	220,705,200	8,049,133	228,754,333	252,042,937	8,813,938	260,856,875
Sales do	10,191,638	4,374,549	14,566,187	15,010,140	4,652,999	19,663,139
Value of sales	$1,195,192	$415,866	$1,611,058	$2,352,159	$521,614	$2,873,773
Light oil derivatives:						
Production gallons	187,347,936	3,372,267	190,720,203	209,795,642	3,950,738	213,746,380
Sales do	184,424,261	3,602,489	188,026,750	203,054,314	3,774,028	206,828,342
Value of sales	$35,693,087	$558,680	$36,251,767	$50,178,099	$767,591	$50,945,690
Naphthalene, crude:						
Production pounds	70,206,106	617,330	70,823,436	98,971,548	758,039	99,729,587
Sales do	[2]56,026,499	617,330	[2]56,643,829	101,899,685	758,039	102,657,724
Value of sales	$2,626,688	$28,127	$2,654,815	$4,398,406	$27,488	$4,425,894
All other coal-chemical materials, value	[2]$11,717,979	$144,796	[2]$11,862,775	$14,852,695	$142,855	$14,995,550

[1] Coke ovens built by city gas companies, some of which are operated in conjunction with coal- and water-gas plants. Does not include independent oven-coke plants that may sell gas to public-utility companies for distribution.

[2] Revised figure.

Copper

By Helena M. Meyer and Gertrude N. Greenspoon

GENERAL SUMMARY

MOST segments of the copper industry experienced increased activity early in 1950, continuing to recover from recession lows of mid-1949. In the latter part of the year this upward movement was accelerated, in large part because of speeding of defense mobilization after the outbreak of war in Korea. Mine, smelter, and refinery outputs from domestic ores, apparent consumption of new copper, and world production were the largest since 1944; refinery output from foreign ores and imports of refined copper were the greatest since 1945. Production of copper from old scrap in 1950 exceeded that in 1949 but was less than in 1948 and 1947. The average quoted price for the year for the electrolytic grade was less than in 1948 but otherwise was higher than at any time since 1918.

Short-lived labor strikes had an adverse effect on production during 1950, but outputs from primary domestic sources by mines, smelters, and refineries increased 20 to 32 percent nonetheless. The railway switchmen's strike early in July threatened output, particularly at Utah and Montana mines, but was terminated after about 1 week; and the "wildcat" strike at the Carteret refinery beginning in the last days of June ended July 18, although "not settled," because of the Korean situation.

Producers' stocks of refined copper at the end of 1950 were the smallest since 1906, whereas unrefined inventories represented a more nearly normal quantity.

Several attempts failed to enact legislation extending the suspension of the excise tax on copper beyond June 30. There was confusion regarding copper prices during the months when it was thought, first, that the suspension would be extended and then, after June 30, that the tax would be suspended and the action made effective retroactively. Additional price confusion was caused during the period of strong demand in the second half of the year, when purchases of copper well above quoted market prices were reported and when toll treatment of scrap purchased in some instances at prices exceeding those for primary copper resulted in costs for metal much larger than market quotations. Foreign copper sold at a premium of 2 cents a pound after the excise tax was resumed on July 1.

The sharp downtrend in prices that accompanied the fall in demand in mid-1949 was reversed before the end of 1949, and the rise continued in 1950. The price for electrolytic copper delivered Connecticut Valley was 18½ cents a pound at the beginning of the year and 24½ cents for domestic copper at the year end.

Early in July the Kennecott Copper Corp. announced that it would dispose of its copper on a uniform delivered price basis throughout the country, marking a noteworthy change in the long-established policy of this company and contrasting with the continuing policy of other companies.

Imports of unmanufactured copper in 1950 established a new peacetime peak for the third successive year. The large receipts in

1950, however, were 19 percent under the all-time record in 1945, and also below those in the other war years, 1941–44.

Exports of refined copper, by far the most important copper-export class, were about the same in 1950 as the average for the preceding 3 years.

The demand for copper increased greatly outside of the United States in 1950, and production and prices rose. The total world mine output (2,750,000 tons) was 11 percent above that in 1949. The expansion of output in Chile was interrupted several times by labor strikes. Two strikes lasting approximately 3 weeks each occurred at the Chuquicamata mine and one lasting from late August until October 1 occurred at the Andes mine. There were a few other strikes of shorter duration. Continued rail-transportation difficulties that impeded delivery of adequate supplies of coal to Northern Rhodesia mines interfered with the reaching of production objectives in that country.

The Defense Production Act, which became law early in September, gave the President the power to regulate the economy to assure adequate supplies of materials for expanded defense and essential civilian requirements. Among other things, it provided means of encouraging increased supplies, as well as of curtailing unessential consumption.

Pursuant to the act, the Defense Minerals Administration was established in the Department of the Interior to render Government assistance to industry in expanding supplies of critical minerals and to act as claimant agency for the mining industry. During 1950, it entered into a number of negotiations with private companies for new copper-production projects.

The National Production Authority in the Department of Commerce was among the other agencies created to carry out other provisions of the act. Orders issued by NPA in 1950 that affected copper were: Regulation 1, which prohibited accumulation of excessive inventories by limiting the quantities of materials that could be ordered, received, or delivered; Order M–12, which reduced civilian use of copper 15 percent in January and February and 20 percent in March 1951; M–11, which set rules for placing, accepting, and scheduling rated orders for copper and copper-base alloys; and M–16, which aimed at maintaining the flow of copper and copper-base alloy scrap through normal channels and limited toll agreements, except as authorized.

On December 15 the British Ministry of Supply announced that, beginning January 1, supplies of imported copper would be restricted to a total equal to the average monthly consumption in the first half of 1950; special "electro" shapes would be cut to two-thirds of the monthly average, the other one-third being permitted as standard copper.

Production Expansion.[1]—Work progressed during 1950 on the "greater Butte project" of the Anaconda Copper Mining Co., Butte, Mont. Extraction of ore from the project should begin early in 1952. Ore production is expected to be 6,000 tons a day in 1952 and 10,000 in 1953, with an eventual output of 15,000 tons of the low-grade ore a day. These daily tonnages will result in annual rates of 20,000, 30,000, and 45,000 tons of copper, respectively, and are in addition to operations in the normal, higher grade Butte vein structures.

[1] For developments before 1950 and background information on the following projects, see Copper chapter in Minerals Yearbook 1949 and earlier years.

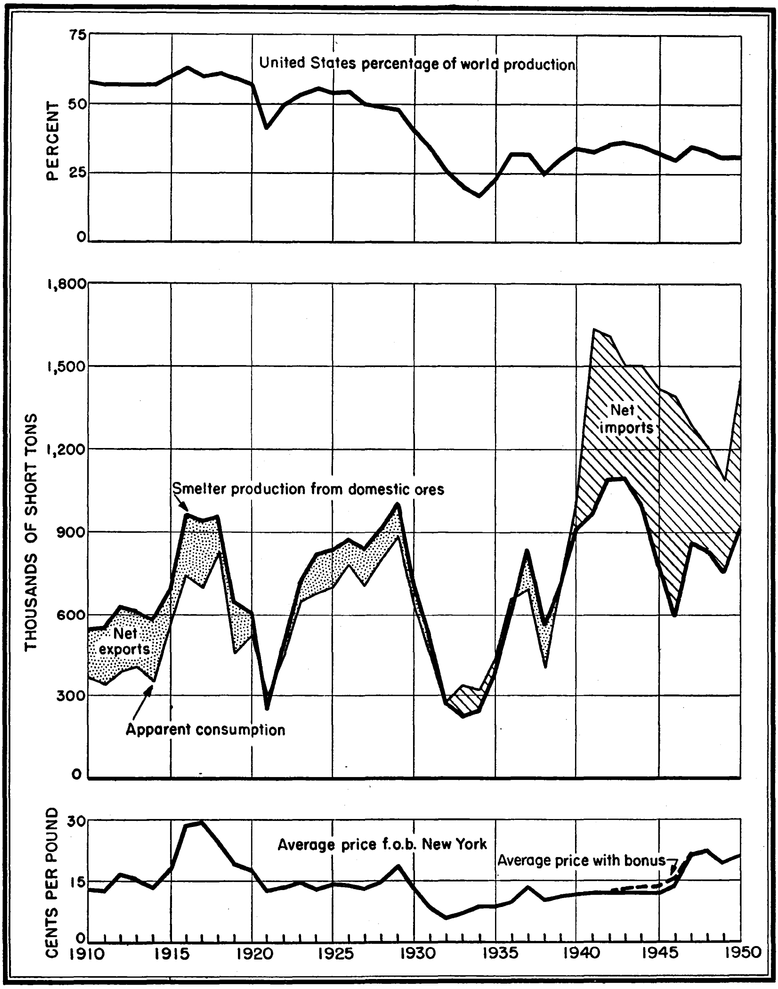

FIGURE 1.—Trends in production, consumption, and price of copper in the United States, 1910–50.

Remodeling of four sections in the copper concentrator at Anaconda to treat ores from the project is proceeding, and two sections were completed. Changes in the remaining two sections were expected to be finished by the end of 1951.

Construction of the new metallurgical plant for treating sulfide ores at the Chuquicamata mine of the Chile Exploration Co., subsidiary of the Anaconda Copper Mining Co., progressed during the year. This plant will consist of a sulfide concentrator and a smelter and should be in full operation before the end of 1952; the first unit should be ready in December 1951. The concentrator will have capacity to treat 30,000 tons of sulfide and mixed ores a day. The smelter will contain three reverberatory furnaces and three Pierce Smith converters. The estimated output will be 150,000 tons of blister copper annually. The expected cost of the new sulfide plant is about $90,000,000, of which $44,836,645 had been expended to the end of 1950; $21,803,984 was expended in 1950.

As a result of exploration work at the White Pine, Mich., property of the Copper Range Co., a substantial tonnage of ore was added to reserves; these were estimated at 309,660,000 tons, containing 21.3 pounds per ton, at the end of the year compared with 249,610,000 tons at its beginning. The company stated that further exploration would undoubtedly add greatly to the foregoing reserves.[2] Extensive research was carried on to assist in determining milling and further metallurgical methods.

A major stripping program providing for expansion of open-pit operations at the Chino mines division of the Kennecott Copper Corp. was begun in 1949 and continued throughout 1950. A drilling campaign was successful in developing a needed additional supply of water. A new unit at the precipitating plant was completed and put into operation, expanding copper production capacity 20 percent to 18,000 tons annually.

At the Nevada mines division of the Kennecott Copper Corp. a contractor began to strip the Kimbley ore body in November. The Consolidated Coppermines Corp. started to ship ore from its recently developed Morris pit to the Nevada division concentrator at McGill in the latter part of 1950.

Work of converting a large part of Kennecott's mining activities at the Ray mines division from underground to open-pit operation progressed to the point where open-pit production was about 8,000 tons of ore a day. When remodeling of the No. 2 crushing plant is completed (about August 1951), it was expected that the mine's full monthly production of 15,000 tons from open pit and underground could be handled.

The new electrolytic refinery of Kennecott at Garfield, Utah, was completed, and the first cathodes were produced September 1. By the year end production was at a monthly rate of 12,000 tons of copper.

At the San Manuel, Ariz., property of the Magma Copper Co., metallurgical test work was carried on continuously to obtain data for designing a reduction and concentrator plant. The work was said to prove the ore to be readily amenable to standard methods of concentration.

Exhaustion of ore reserves at the Miami and Castle Dome properties, Globe-Miami district, Gila County, Ariz., is expected within a few years. Negotiations were concluded in 1950 for a Government loan to bring the Copper Cities property, in the same district, into production. The Castle Dome plant will be moved to the Copper Cities property when the former mine is closed. Both properties are operated by wholly owned subsidiaries of the Miami Copper Corp.

The new smelter of the Phelps Dodge Corp. at Ajo was essentially completed in June, and the smelting of concentrates was begun on July 8. Of total smelter production of 65,858 tons of copper from Ajo concentrates in 1950, the Douglas smelter produced 39,782 tons and the Ajo plant 26,076 tons.

Development as an open-pit mine, of a low-grade body of ore (known as the Bisbee East Ore Body) in the Warren district of Arizona near Bisbee, was under consideration by Phelps Dodge. The ore body was estimated to contain 41,000,000 tons of concentrating ore, of an average grade of 1.14 percent copper; 31,000,000 tons of material to be leached, averaging 0.42 percent copper; and 70,000,000 tons of waste to be removed. It was estimated that $25,000,000 would be required

[2] Annual Report to Stockholders, 1950.

to bring the mine into production. The corporation stated that no production was to be expected from this source until 1954 or 1955 at the earliest.[3]

TABLE 1.—Salient statistics of the copper industry in the United States, 1941–45 (average) and 1946–50, in short tons

	1941–45 (average)	1946	1947	1948	1949	1950
New (primary) copper produced—						
From domestic ores, as reported by—						
Mines	974,894	608,737	847,563	834,813	752,750	909,343
Ore produced:						
Copper ore [1]	87,478,899	62,232,342	87,864,898	84,729,043	76,032,531	94,585,792
Average yield of copper, percent	1.04	.91	.90	.92	.91	.89
Smelters	986,621	599,656	862,872	842,477	757,931	911,352
Percent of world total	35	29	[2] 34	[2] 32	29	31
Refineries	974,374	578,429	909,213	860,022	695,015	920,748
From foreign ores, matte, etc., refinery reports	329,410	300,233	250,757	247,424	232,912	319,086
Total new refined, domestic and foreign	1,303,784	878,662	1,159,970	1,107,446	927,927	1,239,834
Secondary copper recovered from old scrap only	444,229	406,453	503,376	505,464	383,548	485,211
Imports (unmanufactured) [3]	770,988	[2] 396,380	413,890	507,449	[2] 552,709	690,231
Refined	434,991	154,371	149,478	249,124	275,811	317,050
Exports of metallic copper [4]	206,788	97,475	196,999	207,022	195,990	192,339
Refined (ingots and bars)	105,561	52,629	147,642	142,598	137,827	144,561
Stocks at end of year	359,900	350,000	273,000	250,000	322,000	258,000
Refined copper	88,200	96,000	60,000	67,000	61,000	26,000
Blister and materials in solution	271,700	254,000	213,000	183,000	261,000	232,000
Withdrawals (apparent) from total supply on domestic account:						
Total new copper	1,534,000	1,391,000	1,286,000	1,214,000	1,072,000	1,447,000
Total new and old copper (old scrap only)	1,978,000	1,797,000	1,789,000	1,719,000	1,456,000	1,932,000
Price average [5]....cents per pound	11.38	14.4	20.9	21.7	19.7	20.8
World smelter production, new copper	2,855,000	2,067,000	2,513,000	2,623,000	2,640,000	2,962,000

[1] Includes old tailings smelted or re-treated. Not comparable with mine production figure shown in that latter includes recoverable copper content of ores not classified as "copper."
[2] Revised figure.
[3] Data are "general" imports; that is, they include copper imported for immediate consumption plus material entering country under bond. Comprises copper in ingots, plates, and bars, ores and concentrates, regulus, blister, and scrap.
[4] Total exports of copper, exclusive of ore, concentrates, composition metal, and unrefined copper. Exclusive also of "Other manufactures of copper," for which quantity figures are not recorded. (See table 28.)
[5] Exclusive of bonus payments of the Office of Metals Reserve under Premium Price Plan, which covered the period February 1, 1942, to June 30, 1947, inclusive.

Owing to rapid depletion of ore reserves at the mine at Jerome the Clarkdale smelter of Phelps Dodge was closed June 6.

Bureau of Mines Reports.—The following Bureau of Mines reports of investigations, published recently, relate to copper in whole or in part:

4670. Flotation and Cyanidation Tests on a Gold-Copper Sulfide Ore from Cooke, Mont.
4689. Investigation of the Sunrise Copper-Gold Mine, Granite County, Mont.
4701. Douglas Copper Deposit, Hancock County, Maine.
4706. Lake Shore Copper Deposits, Pinal County, Ariz.
4718. Milan Copper Deposit, Coos County, N. H.
4732. Twin Buttes Copper Mine, Pima County, Ariz.
4760. West Belt Copper-Zinc Mines, El Dorado, Amador, Calaveras, and Mariposa Counties, Calif.
4791. Torpedo Copper Deposit, Organ Mining District, Dona Ana County, N. Mex.

The following Bureau of Mines information circulars likewise discussed copper:

7567. Electrical Blasting at Miami Copper Co., Miami, Ariz.
7598. Use of Visual Aids in the Morenci Branch Safety Program, Phelps Dodge Corp., Morenci, Ariz.

[3] Annual Report to Stockholders, 1950.

TABLE 2.—Salient statistics of the copper industry, 1919–50

[All figures in short tons, except price and tenor of ore]

Year	Mine production	Average tenor of copper ores (percent)	Refinery production from—			Imports (refined) [1]	Exports (refined) [1]	Apparent consumption of new copper [2]	Quoted price at New York [3] (cents per pound)	World production (smelter)	Production from scrap as metal and in alloys		
			Domestic ores	Foreign ores	Total						Old scrap	New scrap	Total
1919	606,167	1.65	716,743	168,341	885,084	17,569	219,080	457,236	18.90	1,095,696	152,600	134,590	287,190
1920	612,275	1.63	591,212	171,871	763,083	54,372	275,613	526,919	17.50	1,057,200	168,960	143,500	312,460
1921	233,095	1.70	304,707	170,682	475,389	34,625	298,059	305,494	12.65	614,600	131,990	85,310	217,300
1922	482,292	1.74	452,335	175,423	627,758	51,572	326,333	448,317	13.56	952,400	202,800	133,100	335,900
1923	738,870	1.58	732,083	257,835	989,918	80,356	364,690	650,237	14.61	1,341,500	270,900	140,000	410,900
1924	803,083	1.59	837,107	292,931	1,130,038	72,955	504,812	677,371	13.16	1,493,600	266,200	122,100	388,300
1925	839,059	1.54	841,448	260,839	1,102,287	49,887	484,033	700,506	14.16	1,546,500	291,010	129,200	420,210
1926	862,638	1.46	865,649	295,594	1,161,243	85,283	428,062	785,068	13.93	1,608,300	337,300	142,500	479,800
1927	824,980	1.41	859,476	303,406	1,162,882	51,640	461,233	711,480	13.05	1,673,300	339,400	150,800	490,200
1928	904,898	1.41	895,899	347,905	1,243,804	42,365	474,737	804,269	14.68	1,880,500	365,500	170,900	536,400
1929	997,555	1.41	991,366	378,690	1,370,056	67,007	411,227	889,293	18.23	2,098,800	404,350	222,200	626,550
1930	705,074	1.43	695,612	382,918	1,078,530	43,105	297,057	632,509	13.11	1,760,000	342,200	125,000	467,200
1931	528,875	1.50	537,303	213,418	750,721	87,225	202,698	451,032	8.24	1,536,000	261,300	85,700	347,000
1932	238,111	1.83	222,539	117,895	340,434	83,897	110,977	259,602	5.67	1,027,000	180,980	67,200	248,180
1933	190,643	2.11	240,669	130,120	370,789	5,432	124,582	339,350	7.15	1,143,000	260,300	77,800	338,100
1934	237,401	1.92	233,029	212,331	445,360	27,417	262,366	322,638	8.53	1,448,000	310,900	66,500	377,400
1935	386,491	1.89	338,321	250,484	588,805	18,071	260,735	441,371	8.76	1,681,000	361,700	87,200	448,900
1936	614,516	1.54	645,462	177,027	822,489	4,782	220,390	656,179	9.58	1,895,000	382,700	101,900	484,600
1937	841,998	1.29	822,253	244,561	1,066,814	7,487	295,064	694,906	13.27	2,585,000	408,900	123,200	532,100
1938	557,763	1.34	552,574	239,842	792,416	1,802	370,545	406,994	10.10	2,254,000	267,300	92,500	359,800
1939	728,320	1.25	704,873	304,642	1,009,515	16,264	372,777	714,873	11.07	2,396,000	286,900	212,800	499,700
1940	878,086	1.20	927,239	386,317	1,313,556	68,337	356,431	1,008,785	11.40	2,734,000	333,890	198,156	532,046
1941	958,149	1.15	975,408	419,901	1,395,309	346,994	103,602	1,641,550	11.87	2,905,000	412,699	313,697	726,396
1942	1,080,061	1.09	1,064,792	349,769	1,414,561	401,436	131,406	1,608,000	11.87	3,076,000	427,122	500,633	927,755
1943	1,090,818	1.04	1,082,079	297,184	1,379,263	402,762	175,859	1,502,000	11.87	3,038,000	427,521	658,526	1,086,047
1944	972,549	.99	973,852	247,335	1,221,187	492,395	68,373	1,504,000	11.87	2,847,000	456,710	494,232	950,942
1945	772,894	.93	775,738	332,861	1,108,599	531,367	48,563	1,415,000	11.87	2,436,000	497,095	509,421	1,006,516
1946	608,737	.91	578,429	300,233	878,662	154,371	52,629	1,391,000	13.92	2,067,000	406,453	397,093	803,546
1947	847,563	.90	909,213	250,757	1,159,970	149,478	147,642	1,286,000	21.15	2,513,000	503,376	458,365	961,741
1948	834,813	.92	860,022	247,424	1,107,446	249,124	142,598	1,214,000	22.20	2,623,000	505,464	467,324	972,788
1949	752,750	.91	695,015	232,912	927,927	275,811	137,827	1,072,000	19.36	2,640,000	383,548	329,595	713,143
1950	909,343	.89	920,748	319,086	1,239,834	317,050	144,561	1,447,000	21.46	2,962,000	485,211	492,028	977,239

[1] Imports and exports may include some refined copper produced from scrap. Categories not wholly comparable from year to year.

[2] Adjusted for changes in stocks.

[3] American Metal Market price for electrolytic copper in New York; f. o. b. refinery through August 1927, New York refinery equivalent thereafter.

DOMESTIC PRODUCTION

Statistics on copper production may be compiled upon a mine, smelter, or refinery basis. Mine data are most accurate for showing the geographic distribution of production; smelter figures are better than mine figures for showing the actual recovery of metal and more accurate than refinery figures for showing the source of production; and refinery statistics are best for showing recovery of metal but indicate only in a general way the source of crude materials treated. Mineral Resources of the United States, 1930, part I (pp. 701–702), discusses differences among the three sets of figures.

TABLE 3.—Copper produced from domestic ores, as reported by mines, smelters, and refineries, 1946–50, in short tons

Year	Mine [1]	Smelter	Refinery
1946	608,737	599,656	578,429
1947	847,563	862,872	909,213
1948	834,813	842,477	860,022
1949	752,750	757,931	695,015
1950	909,343	911,352	920,748

[1] Includes Alaska.

PRIMARY COPPER

Mine Production.—The figures for mine production are tabulated from reports supplied by all domestic mines that produce copper. These data are classified geographically, by metallurgical method, and by type of ore. Tables presenting the information in detail are to be found in the State chapters of this volume.

As usual, Arizona led all other States by a wide margin in production in 1950, supplying 44 percent of the total for the United States, followed by Utah, with 31 percent. Arizona's output comes from a number of important copper-producing districts and mines, whereas Utah's is predominantly from one mine, the largest copper producer in the United States. Production from New Mexico, Montana, Nevada, and Michigan, ranking next in importance as copper producers in 1950, made up 22 percent of the total. These six States produced 97 percent of the United States total in 1950 and 96 percent in 1949.

Classification of production by mining method shows that approximately 74 percent of the recoverable copper and 81 percent of the

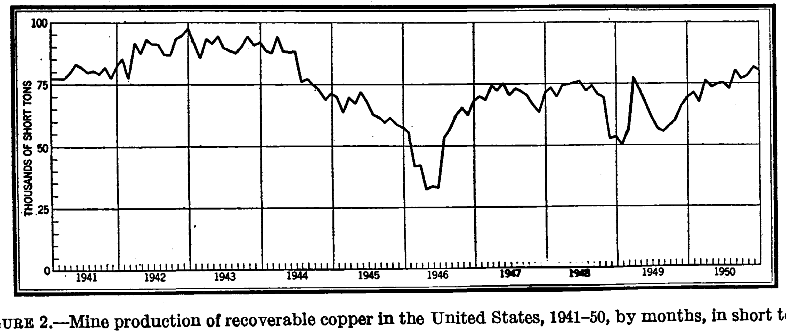

FIGURE 2.—Mine production of recoverable copper in the United States, 1941–50, by months, in short tons.

copper ore came from open pits in 1950. Most of the domestic copper ore was treated by flotation at or very near the mine of origin, and the resulting concentrates were shipped for smelting. Some copper ores were direct-smelted either because of their high grade or because of their fluxing qualities.

TABLE 4.—Mine production of recoverable copper in the United States in 1950, by months [1]

Month	Short tons	Month	Short tons
January	71,376	August	80,598
February	67,188	September	77,025
March	76,061	October	78,175
April	73,596	November	81,726
May	74,821	December	80,667
June	75,170		
July	72,940	Total	909,343

[1] Includes Alaska. Monthly figures adjusted to final annual mine production total.

TABLE 5.—Mine production of copper in the principal districts [1] of the United States, 1941–45 (average) and 1946–50, in terms of recoverable copper, in short tons

District or region	State	1941–45 (average)	1946	1947	1948	1949	1950
West Mountain (Bingham)	Utah	279,405	112,083	264,315	225,225	196,101	277,655
Copper Mountain (Morenci)	Arizona	73,267	95,366	147,899	148,316	141,934	154,689
Globe-Miami	do	90,230	88,556	91,032	88,478	80,189	84,688
Ajo	do	57,359	45,233	49,687	55,615	58,350	64,400
Central (including Santa Rita)	New Mexico	[2] 66,359	[2] 48,806	57,071	[2] 72,784	[2] 53,276	63,694
Summit Valley (Butte)	Montana	121,332	57,905	57,187	57,712	55,945	53,897
Robinson (Ely)	Nevada	62,030	45,777	47,524	44,491	37,533	52,087
Mineral Creek (Ray)	Arizona	35,464	16,355	18,935	18,753	18,595	36,442
Lake Superior	Michigan	42,341	21,663	24,184	27,777	19,506	25,608
Pioneer (Superior)	Arizona	15,945	12,244	15,922	18,720	21,616	22,636
Warren (Bisbee)	do	41,181	4,605	17,059	19,204	9,840	13,345
Verde (Jerome)	do	33,348	16,176	14,603	14,544	17,215	13,291
Eureka (Bagdad)	do	2,848	5,932	6,491	7,247	7,906	10,673
Chelan Lake	Washington	7,092	4,494	2,214	5,654	[3] 5,249	[3] 4,904
Southeastern Missouri	Missouri	2,148	1,857	1,760	2,370	3,670	2,982
San Juan Mountains	Colorado	666	1,333	1,430	1,865	1,974	2,582
Lordsburg	New Mexico	2,619	1,196	1,770	1,708	1,934	2,061
Coeur d'Alene	Idaho	2,053	810	1,312	1,388	1,171	1,896
Cochise	Arizona	175	987	1,036	968	689	498
Cope	Nevada	(4)	(4)	1,105	14	[5] 13	2
Burro Mountain	New Mexico	(2)	(2)	1,140	(2)	(2)	-------
Ione	California	275	1,004	837	-------	-------	-------
Flat Creek [6]	do	773	(4)	698	(4)	(4)	(4)
Lebanon (Cornwall mine) [6]	Pennsylvania	(4)	(4)	(4)	(4)	(4)	(4)
Ducktown [6]	Tennessee	(4)	(4)	(4)	(4)	(4)	(4)
Orange County [6]	Vermont	(4)	(4)	(4)	(4)	(4)	(4)

[1] Districts producing 1,000 short tons or more in any year of the period 1946–50.
[2] Burro Mountain included with Central. Bureau of Mines not at liberty to publish separate figures.
[3] Includes Peshastin Creek and Wenatchee. Bureau of Mines not at liberty to publish separate figures.
[4] Bureau of Mines not at liberty to publish figures.
[5] Includes Van Duzer. Bureau of Mines not at liberty to publish separate figures
[6] Not listed in order of output.

232294—53——31

TABLE 6.—Mine production of recoverable copper in the United States, 1940–50, with production of maximum year, and cumulative production from earliest record to end of 1950, by States, in short tons

State	Maximum production [1]		Production by years											Total production from earliest record to end of 1950
	Year	Quantity	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	
Western States and Alaska:														
Alaska	1916	59,927	55	72	22	27	2	5	2	12	16	4	6	685,904
Arizona	1929	415,314	281,169	326,317	393,387	403,181	358,303	287,203	289,223	366,218	375,121	359,010	403,301	12,681,742
California	1909	28,644	6,438	3,943	1,058	8,762	12,721	6,473	4,240	2,407	481	649	646	630,007
Colorado	1938	14,171	12,152	6,748	1,102	1,028	1,048	1,485	1,754	2,150	2,298	2,403	3,141	260,703
Idaho	1907	5,445	3,349	3,621	3,430	2,324	1,688	1,548	1,038	1,640	1,624	1,438	2,107	114,596
Montana	1916	176,464	126,391	128,036	141,194	134,525	118,190	88,506	58,481	57,900	58,252	56,611	54,478	6,805,594
Nevada	1942	83,663	78,454	78,911	83,663	71,068	61,232	52,595	48,616	49,603	45,242	38,058	52,569	1,968,140
New Mexico	1942	80,100	69,848	73,478	80,100	76,163	69,730	56,571	50,191	60,205	74,687	55,388	66,300	1,606,779
Oregon	1916	1,791	88	83	103	6	3	1	7	14	2	20	19	12,398
South Dakota	1918	32	6	--	1	--	1	--	--	--	--	--	--	106
Texas	1928	224	30	6	99	81	115	55	3	6	23	24	2	1,364
Utah	1943	323,989	231,864	266,838	306,691	323,989	282,575	226,376	114,284	266,533	227,007	197,245	278,630	5,869,856
Washington	1940	9,612	9,612	8,686	8,030	7,315	6,169	5,821	4,527	2,240	5,665	5,275	5,057	97,163
Wyoming	1900	2,102	2	4	--	--	--	--	1	--	--	--	--	16,326
Total	--	--	819,458	896,743	1,018,880	1,028,469	911,777	726,639	572,367	808,928	790,418	716,125	866,256	30,750,678
West Central States:														
Missouri	1949	3,670	685	1,400	1,300	1,340	3,302	3,399	1,857	1,760	2,370	3,670	2,982	[2] 30,460
States east of the Mississippi:														
Alabama	1907	42	--	--	--	--	--	--	--	--	--	--	--	(3)
Georgia	1917	465	13	--	--	--	--	--	--	--	--	--	--	(3)
Maine	1918	383	--	--	--	--	--	--	--	--	--	--	--	(3)
Maryland	1917	146	--	--	--	--	--	--	--	--	--	--	--	(3)
Massachusetts	1906	5	--	--	--	--	--	--	--	--	--	--	--	(3)
Michigan	1916	136,846	45,198	46,440	45,679	46,764	42,421	30,401	21,663	24,184	27,777	19,506	25,608	4,916,565
New Hampshire	1908	[4] 94	--	--	--	--	--	--	--	--	--	--	--	(3)
North Carolina	1930	(5)	(6)	(6)	(6)	(6)	(6)	--	--	--	--	--	--	(3)
Pennsylvania	1942	(5)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(6)	(3)
South Carolina	(3)	(3)	(7)	(7)	(7)	(7)	--	--	--	--	--	--	--	(3)
Tennessee	1930	(5)	[6] 12,732	[6] 13,566	[6] 14,174	[6] 13,855	[6] 12,860	[6] 12,385	[6] 12,850	[6] 12,686	[6] 14,248	[6] 13,449	[6] 14,497	(3)
Vermont	1946	(5)	--	--	--	290	1,898	(6)	(6)	(6)	(6)	(6)	(6)	(3)
Virginia	1944	291	--	--	28	100	291	70	--	5	--	--	--	(3)
Wisconsin	1914	5	--	--	--	--	--	--	--	--	--	--	--	(2)
Total	--	--	57,943	60,006	59,881	61,009	57,470	42,856	34,513	36,875	42,025	32,955	40,105	[8] 5,540,594
Grand total	1943	1,090,818	878,086	958,149	1,080,061	1,090,818	972,549	772,894	608,737	847,563	834,813	752,750	909,343	[9] 36,321,732

[1] For Missouri and States east of the Mississippi, maximum since 1905.
[2] Small quantity for Wisconsin included with Missouri.
[3] Data not available.
[4] The 1908 volume of Mineral Resources credits this figure to Massachusetts and New Hampshire; the 1909 volume credits it to New Hampshire alone.
[5] Bureau of Mines not at liberty to publish figure.
[6] Tennessee includes other States indicated by footnote 6; Bureau of Mines not at liberty to publish separate figures.
[7] Less than 0.5 ton.
[8] For States other than Michigan, figures represent largely smelter output. Excludes small quantity, not separable, for Wisconsin shown with Missouri.
[9] Largely smelter production for States east of the Mississippi except Michigan.

TABLE 7.—Twenty-five leading copper-producing mines in the United States in 1950, in order of output

Rank	Mine	District	State	Operator	Source of copper
1	Utah Copper	West Mountain (Bingham)	Utah	Kennecott Copper Corp	Copper ore.
2	Morenci	Copper Mountain (Morenci)	Arizona	Phelps Dodge Corp	Do.
3	New Cornelia	Ajo	do	do	Do.
4	Chino	Central	New Mexico	Kennecott Copper Corp	Do.
5	Butte Mines	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Copper, zinc-lead ores.
6	Ruth Pit [1]	Robinson (Ely)	Nevada	Kennecott Copper Corp	Copper ore.
7	Inspiration	Globe-Miami	Arizona	Inspiration Consolidated Copper Co	Do.
8	Ray	Mineral Creek (Ray)	do	Kennecott Copper Corp	Do.
9	Miami	Globe-Miami	do	Miami Copper Co	Do.
10	Castle Dome	do	do	Castle Dome Copper Co., Inc	Do.
11	Magma	Pioneer (Superior)	do	Magma Copper Co	Copper, zinc-copper ores.
12	Calumet & Hecla Consolidated	Lake Superior	Michigan	Calumet & Hecla Consolidated Copper Co	Copper ore and tailings.
13	Copper Queen	Warren (Bisbee)	Arizona	Phelps Dodge Corp	Copper, zinc-lead ores.
14	United Verde	Verde (Jerome)	do	do	Copper, zinc-copper ores.
15	Bagdad	Eureka (Bagdad)	do	Bagdad Copper Corp	Copper ore.
16	Ruth Pit Extension [2]	Robinson (Ely)	Nevada	Consolidated Coppermines Corp	Do.
17	Burra Burra, Calloway, Mary, Eureka, Boyd.	Polk County	Tennessee	Tennessee Copper Co	Copper-bearing pyrites.
18	Holden	Chelan Lake	Washington	Howe Sound Co	Zinc-copper ore.
19	Cornwall	Lebanon County	Pennsylvania	Bethlehem Steel Co	Magnetite-pyrite-chalcopyrite ore.
20	Elizabeth	Orange County	Vermont	Vermont Copper Co., Inc	Copper ore.
21	Quincy	Lake Superior	Michigan	Quincy Mining Co	Copper-ore tailings.
22	Bonney-Miser's Chest	Lordsburg	New Mexico	Banner Mining Co	Copper ore.
23	Treasury Tunnel-Black Bear	Upper San Miguel	Colorado	Idarado Mining Co	Zinc-lead-copper ores.
24	Champion	Lake Superior	Michigan	Copper Range Co	Copper ore.
25	United States & Lark	West Mountain (Bingham)	Utah	U. S. Smelting, Refining & Mining Co	Gold-silver, lead, silver, zinc-lead ores.

[1] Shown as "Ruth & Copper Flat Pit" in 1949 chapter.
[2] Shown as "Consolidated Coppermines group" in 1949 chapter.

The first 5 mines in the foregoing table produced 67 percent of the United States total, the first 10 produced 85 percent, and the entire 25 furnished 98 percent.

Quantity and Estimated Recoverable Content of Copper-Bearing Ores.—Tables 8 through 11 list the quantity and estimated recoverable copper content of the ore produced by copper mines in the United States in 1949 and 1950. Of the total copper produced from copper ores in the United States during 1950 (1949 data in parentheses), 94 (93) percent was obtained from ores concentrated before smelting, 2 (3) percent from direct-smelting ores, and 4 (4) percent from ore treated by straight leaching.

Close agreement between the output as reported by smelters and the recoverable quantity as reported by mines indicates that estimated recoverable tenor is close to actual recovery. Classification of some of the complex western ores is difficult and more or less arbitrary. "Copper ores" include not only all those that contain 2.5 percent or more recoverable copper but also those that contain less than this percentage if they are valuable chiefly for copper, notably the "porphyry ores." Mines report considerable copper from ores mined primarily for other products. These include siliceous gold and silver ores, lead and zinc ores, and pyritic ores.

TABLE 8.—Copper ore, old tailings, etc., sold or treated in the United States in 1949–50, with copper, gold, and silver content in terms of recoverable metal

State	Ore, old tailings, etc., sold or treated (short tons)	Recoverable metal content				Value of gold and silver per ton of ore
		Copper		Gold (fine ounces)	Silver (fine ounces)	
		Pounds	Percent			
1949						
Arizona	37,365,611	[1] 683,129,855	0.91	78,735	2,412,359	$0.13
California	250	[1] 30,400	6.08	35	1,256	9.45
Colorado	3,838	233,625	3.04	296	59,069	16.63
Idaho	384	82,510	10.74	10	554	2.22
Michigan	3,542,868	39,012,000	.55			
Montana	1,231,266	[1] 101,289,540	4.11	5,027	1,845,783	1.50
Nevada	4,897,598	[1] 74,197,100	.76	38,135	133,910	.30
New Mexico	6,105,174	[1] 79,160,743	.65	2,304	155,094	.04
Oregon	46	5,800	6.30	2	22	1.96
Texas	1,249	46,000	1.84		81	.06
Utah	20,924,274	[1] 374,421,560	.89	267,891	2,233,708	.54
Washington [2]	627,422	10,526,700	.84	42,974	131,839	2.59
East of the Mississippi (except Michigan)	1,332,551	[3] 26,898,000		291	69,279	
Total	[2] 76,032,531	[3] 1,389,033,833	.91	435,700	7,042,954	.28
1950						
Arizona	41,757,273	[1] 765,358,274	0.92	79,567	2,853,599	.13
California	2,490	[1] 194,500	3.90	1,126	7,627	18.60
Colorado	639	67,994	5.32	27	13,081	20.01
Idaho	787	89,045	5.66	9	20,038	23.44
Michigan	4,386,474	51,216,000	.58			
Montana	1,192,789	[1] 94,597,750	3.97	3,708	1,729,611	1.42
Nevada	6,693,277	[1] 103,465,000	.77	49,438	147,599	.28
New Mexico	7,510,499	[1] 98,858,311	.66	2,587	127,455	.03
Oregon						
Texas						
Utah	31,049,641	[1] 539,119,716	.87	413,090	3,312,949	.56
Washington [2]	657,920	9,817,508	.75	33,347	109,791	1.93
East of the Mississippi (except Michigan)	1,334,003	[3] 28,994,000		306	68,163	
Total	[2] 94,585,792	[3] 1,691,778,098	.89	583,205	8,389,913	.30

[1] Excludes copper recovered from precipitates as follows: 1949: Arizona, 19,923,626 pounds; California, 60,100 pounds; Montana, 4,419,019 pounds; Nevada, 1,038,400 pounds; New Mexico, 30,789,314 pounds; Utah, 15,822,418 pounds. 1950: Arizona, 24,778,121 pounds; California, 45,500 pounds; Montana, 6,656,414 pounds; Nevada, 799,500 pounds; New Mexico, 33,060,113 pounds; Utah, 14,561,870 pounds.

[2] Includes ore from Washington classed as zinc-copper ore and copper, gold, and silver recovered therefrom.

[3] Copper from magnetite-pyrite-chalcopyrite ore included with that from copper ore.

TABLE 9.—Copper ore, old tailings, etc., concentrated in the United States in 1949–50, with content in terms of recoverable copper

State	Ore, old tailings, etc., concentrated (short tons)	Recoverable copper content	
		Pounds	Percent
1949			
Arizona	[1] 33,528,676	[2] 587,407,347	0.88
Colorado			
Idaho	50	2,345	2.35
Michigan	3,542,868	39,012,000	.55
Montana	1,204,471	98,984,018	4.11
Nevada	4,847,536	73,098,300	.75
New Mexico	6,013,122	77,481,222	.64
Utah	20,922,420	373,960,201	.89
Washington [3]	627,316	10,498,200	.84
East of the Mississippi (except Michigan)	1,332,551	[4] 26,898,000	1.01
Total	72,019,010	1,287,341,633	.89
1950			
Arizona	[1] 37,586,791	[2] 662,985,876	.88
Colorado	40	3,734	4.67
Idaho	25	1,300	2.60
Michigan	4,386,474	51,216,000	.58
Montana	1,156,600	93,139,887	4.03
Nevada	6,626,020	102,387,600	.77
New Mexico	7,411,076	96,605,873	.65
Utah	31,047,220	538,733,800	.87
Washington [3]	657,920	9,817,508	.75
East of the Mississippi (except Michigan)	1,334,003	[4] 28,994,000	1.09
Total	90,206,169	1,583,885,578	.88

[1] In addition, 3,368,001 tons were treated by straight leaching in 1949, and 3,755,362 tons in 1950.
[2] In addition, 57,028,112 pounds of copper were recovered by straight leaching in 1949, and 65,843,700 pounds in 1950.
[3] Zinc-copper ore.
[4] Includes copper from magnetite-pyrite-chalcopyrite ore.

TABLE 10.—Copper ore, old tailings, etc., shipped to smelters in the United States in 1949–50, with content in terms of recoverable copper

State	Ore, old tailings, etc., shipped to smelters		
	Short tons	Recoverable copper content	
		Pounds	Percent
1949			
Arizona	468,934	38,694,396	4.13
California	250	30,400	6.08
Colorado	3,838	233,625	3.04
Idaho	334	80,165	12.00
Montana	26,795	2,305,522	4.30
Nevada	50,062	1,098,800	1.10
New Mexico	92,052	1,679,521	.91
Oregon	46	5,800	6.30
Texas	1,249	46,000	1.84
Utah	1,854	461,359	12.44
Washington	106	28,500	13.44
Total	645,520	44,664,088	3.46
1950			
Arizona	415,120	36,528,698	4.40
California	2,490	194,500	3.90
Colorado	599	64,260	5.36
Idaho	762	87,745	5.76
Montana	36,189	1,457,863	2.01
Nevada	67,257	1,077,400	.80
New Mexico	99,423	2,252,438	1.13
Oregon			
Texas			
Utah	2,421	385,916	7.97
Washington			
Total	624,261	42,048,820	3.37

TABLE 11.—Copper ores [1] produced in the United States, 1941–45 (average) and 1946–50, and average yield in copper, gold, and silver

Year	Smelting ores		Concentrating ores		Total				
	Short tons	Yield in copper (percent)	Short tons	Yield in copper (percent)	Short tons [2]	Yield in copper (percent)	Yield per ton in gold (ounce)	Yield per ton in silver (ounce)	Value per ton in gold and silver
1941–45 (average)	1,816,760	3.90	82,199,004	0.98	[3] 87,478,899	1.04	0.0058	0.157	$0.31
1946	742,666	3.12	58,520,635	.88	[3] 62,232,342	.91	.0046	.091	.23
1947	910,018	3.66	83,283,080	.87	[3] 87,864,898	.90	.0058	.095	.29
1948	877,748	3.78	80,098,098	.89	[3] 84,729,043	.92	.0058	.094	.29
1949	645,520	3.46	72,019,010	.89	[3] 76,032,531	.91	.0057	.093	.28
1950	624,261	3.37	90,206,169	.88	[3] 94,585,792	.89	.0062	.089	.30

[1] Includes old tailings, smelted or retreated, etc.
[2] Includes copper ore leached.
[3] Includes ore from Washington classed as zinc-copper ore.

Smelter Production.—The recovery of copper by smelters in the United States from ores of domestic origin totaled 911,352 short tons in 1950, a 20-percent increase from the total of 757,931 tons for 1949. Output of United States smelters from domestic ores constituted 51 percent of the world production during 1925–29 but dropped sharply in the succeeding years until 1934, when it was only 17 percent. From 1936 to 1941 it fluctuated between 25 and 33 percent; in 1942–44 it was slightly above 35 percent; and in 1945–50 it ranged from 29 to 34 percent; for the year 1950 alone it was 31 percent.

The figures for smelter production shown in table 12 are based upon returns from all primary smelters handling copper-bearing materials produced in the United States. Blister copper is accounted for in terms of fine-copper content. Some casting and electrolytic copper produced direct from ore or matte is included in the smelter production, as well as in the refinery output. For Michigan, furnace-refined copper is included. Metallic and cement copper recovered by leaching is included in smelter production.

The quantity and value of copper produced from domestic ores by smelters in the United States are shown by years for 1845–1930 in Mineral Resources of the United States, 1930, part I (p. 703).

TABLE 12.—Copper produced (smelter output from domestic ores, in the United States, 1941–45 (average) and 1946–50, and total, 1845–1950

Year	Short tons	Value [1] (thousands of dollars)
1941–45 (average)	986,621	232,843
1946	599,656	172,701
1947	862,872	360,680
1948	842,477	365,635
1949	757,931	298,625
1950	911,352	379,122
Total 1845–1950	36,405,873	10,992,996

[1] Excludes bonus payments of Office of Metals Reserve under Premium Price Plan in effect Feb. 1, 1942, to June 30, 1947.

TABLE 13.—Copper smelters and refineries in the United States in 1950

[Plants that treat primary crude materials exclusively or chiefly]

Location	Company	Final product
Arizona:		
Ajo	Phelps Dodge Corp., 40 Wall St., New York 5, N. Y.	Blister.
Clarkdale [1]	do	Do.
Morenci	do	Do.
Douglas	do	Do.
Hayden	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Do.
Inspiration	Inspiration Consolidated Copper Co., 25 Broadway, New York 4, N. Y.	Electrolytic.
Miami	International Smelting & Refining Co., 25 Broadway, New York 4, N. Y.	Blister.
Superior	Magma Copper Co., Superior, Ariz	Do.
Maryland: Baltimore	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Electrolytic.
Michigan:		
Hancock	Quincy Mining Co., 63 Wall St., New York 5, N. Y.	Lake.
Houghton	Copper Range Co. (idle), Houghton, Mich	Do.
Hubbell	Calumet & Hecla Consolidated Copper Co., Calumet, Mich.	Do.
Montana:		
Anaconda	Anaconda Copper Mining Co., 25 Broadway, New York 4, N. Y.	Blister.
Great Falls	do	Electrolytic.
Nevada: McGill	Kennecott Copper Corp., 120 Broadway, New York 5, N. Y.	Blister.
New Jersey:		
Carteret	American Metal Co., 61 Broadway, New York 6, N. Y.	Blister and electrolytic.
Perth Amboy	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Electrolytic.
Do	International Smelting & Refining Co., 25 Broadway, New York 4, N. Y.	Do.
New Mexico: Hurley	Kennecott Copper Corp., 120 Broadway, New York 5, N. Y.	Blister and fire-refined.
New York: Laurel Hill	Phelps Dodge Refining Corp., 40 Wall St., New York 5, N. Y.	Blister and electrolytic.
Tennessee: Copperhill	Tennessee Copper Co., 61 Broadway, New York 6, N. Y.	Blister.
Texas:		
El Paso	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Do.
Do	Phelps Dodge Refining Corp., 40 Wall St., New York 5, N. Y.	Electrolytic and fire-refined.
Utah:		
Garfield	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Blister.
Do	Kennecott Copper Corp., 120 Broadway, New York 5, N. Y.	Electrolytic.
Tooele	International Smelting & Refining Co., 25 Broadway, New York 4, N. Y.	Blister.
Washington: Tacoma	American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.	Blister and electrolytic.

[1] Permanently closed during year.

Primary smelters in the United States are shown in table 13. The Clarkdale, Ariz., smelter of the Phelps Dodge Corp. was permanently closed during the year, and the new plant of the same company at Ajo, Ariz., began to produce during the third quarter.

Refinery Production.—The refinery output of primary copper in the United States in 1950 was made by 13 plants, shown in table 13; 9 of these employed the electrolytic method only, 2 the furnace process on Lake Superior copper, 1 the furnace process on western ores, and 1 both electrolytic and the furnace methods.

Five large electrolytic refineries are on the Atlantic seaboard, three Lake refineries on the Great Lakes, and four electrolytic refineries west of the Great Lakes—one at Great Falls, Mont.; one at Tacoma, Wash.;

one at El Paso, Tex.; and a new plant at Garfield, Utah. In 1942 fire-refined copper was produced for the first time at the Hurley, N. Mex., plant of the Kennecott Copper Corp.; virtually all of the plant output was treated by this method in 1949, but a substantial part went as blister to electrolytic refineries in 1950. The El Paso plant of the Phelps Dodge Refining Corp. produced fire-refined copper in addition to the electrolytic grade. The new electrolytic refinery of the Kennecott Copper Corp. at Garfield, Utah, went into production in the third quarter of 1950. Of the plants specified above, the Lake refinery of the Copper Range Co. has been idle since October 9, 1945. That of the Quincy Mining Co., idle since 1933, was reopened in the final quarter of 1948 and continued to produce through 1950.

The leaching plant of the Inspiration Consolidated Copper Co. at Inspiration, Ariz., is not, strictly speaking, a refinery, although so listed here; it produces electrolytic copper direct from leaching solutions. At one time all of this copper was shipped as cathodes to other refineries, where it was melted and cast into merchant shapes. In 1946, however, more than one-third went directly to consuming plants. In 1947 and 1948, the practice was continued on a considerably reduced scale, virtually ceased in 1949, and expanded again in 1950.

These 14 plants constitute what commonly are termed "primary refineries." The electrolytic plants, exclusive of that at Inspiration, have a rated capacity of 1,560,000 tons of refined copper a year. They produced at the rate of 84 percent of capacity in 1950.

Tables 14 and 15 show the production of refined copper at primary refining plants, classified according to source of copper, grade, and form in which cast.

TABLE 14.—Primary and secondary copper produced by primary refineries in the United States, 1941–45 (average) and 1946–50, in short tons

	1941–45 (average)	1946	1947	1948	1949	1950
Primary:						
From domestic ores, etc.:[1]						
Electrolytic	867, 682	475, 571	805, 718	745, 102	606, 826	821, 803
Lake	41, 736	21, 567	23, 998	26, 511	17, 608	29, 555
Casting	64, 956	81, 291	79, 497	88, 409	70, 581	69, 390
Total	974, 374	578, 429	909, 213	860, 022	695, 015	920, 748
From foreign ores, etc.:[1]						
Electrolytic	321, 276	300, 233	250, 757	247, 424	232, 912	319, 086
Casting and best select	8, 134					
Total refinery production of new copper	1, 303, 784	878, 662	1, 159, 970	1, 107, 446	927, 927	1, 239, 834
Secondary:						
Electrolytic[2]	91, 044	97, 615	249, 560	222, 602	196, 850	173, 063
Casting	7, 024	7, 957	19, 525	22, 774	15, 542	16, 683
Total secondary	98, 068	105, 572	269, 085	245, 376	212, 392	189, 746
Grand total	1, 401, 852	984, 234	1, 429, 055	1, 352, 822	1, 140, 319	1, 429, 580

[1] The separation of refined copper into metal of domestic and foreign origin is only approximate, as an accurate separation at this stage of manufacture is not possible.
[2] Includes copper reported from foreign scrap.

TABLE 15.—Copper cast in forms at primary refineries in the United States, 1948–50

Form	1948		1949		1950	
	Thousands of short tons	Percent	Thousands of short tons	Percent	Thousands of short tons	Percent
Wire bars	783	58	665	59	799	56
Cathodes	76	5	128	11	189	13
Billets	187	14	108	10	172	12
Cakes	134	10	106	9	130	9
Ingots and ingot bars	148	11	117	10	111	8
Other forms	25	2	16	1	29	2
Total	1, 353	100	1, 140	100	1, 430	100

In addition to the primary refineries, many plants throughout the country operate on scrap exclusively, producing metallic copper and a variety of alloys. The output of these plants is not included in the statements of refined-copper production in tables 14 and 15 but is included in table 17, on secondary-copper production.

Copper Sulfate.—Production and shipments of copper sulfate in 1950 were greater than in 1949. Shipments exceeded production in both years and stocks at the end of 1950 were only 19 percent of those held two years earlier.

Copper sulfate produced from blister or shot copper and from scrap is shown in table 16. The copper content thereof is not included in refinery production.

TABLE 16.—Production, shipments and stocks of copper sulfate in 1946–50, in short tons

Year	Production		Shipments (gross weight)	Stocks at end of year [1] (gross weight)
	Gross weight	Copper content		
1946	127, 800	31, 956	124, 700	13, 000
1947	89, 100	22, 276	86, 600	10, 200
1948	96, 700	24, 186	93, 100	11, 800
1949	79, 000	19, 749	84, 400	6, 400
1950	87, 300	21, 814	91, 300	2, 200

[1] Some small quantities are purchased and used by producing companies, so that the figures given do not balance exactly.

SECONDARY COPPER

Copper recovered from copper scrap, copper-alloy scrap, and other copper-bearing scrap materials as metal, as copper alloys without separation of the copper, or as copper compounds is known as secondary copper. Quantities are reported in terms of copper content.

Secondary copper is produced from new and from old scrap. "New scrap" is defined as refuse produced during manufacture of copper articles and includes defective finished or semifinished articles that must be reworked. Typical examples of new scrap are defective castings, clippings, punchings, turnings, borings, skimmings, drosses, and slag. "Old scrap" consists of metal articles that have been discarded after having been used. Such articles may be worn out, obsolete, or damaged. Typical examples are discarded trolley wire, fired cartridge cases, used pipe, and lithographers' plates.

Table 17 summarizes the production of secondary copper during 1941–50. Refined copper produced from scrap at primary refineries is included in the "unalloyed" class. Detailed information appears in the Secondary Metals—Nonferrous chapter of this volume.

TABLE 17.—Secondary copper produced in the United States, 1941–45 (average) and 1946–50, in short tons

	1941–45 (average)	1946	1947	1948	1949	1950
Copper recovered as unalloyed copper	120, 678	136, 909	303, 092	284, 026	250, 089	260, 704
Copper recovered in alloys [1]	818, 853	666, 637	658, 649	688, 762	463, 054	716, 535
Total secondary copper	939, 531	803, 546	961, 741	972, 788	713, 143	977, 239
From new scrap	495, 302	397, 093	458, 365	467, 324	329, 595	492, 028
From old scrap	444, 229	406, 453	503, 376	505, 464	383, 548	485, 211
Percentage equivalent of domestic mine output	96	132	113	117	95	107

[1] Includes copper in chemicals, as follows: 1941–45 (average), 14,460; 1946, 19,192; 1947, 18,838; 1948, 17,612; 1949, 14,840; 1950, 17,413.

CONSUMPTION

Consumption of primary copper, which includes copper shipped to the National Stockpile, was at a new peacetime peak in 1950. Figures on apparent consumption, as well as the derivation of these figures are shown in table 18; data for a long period are available on this basis. In estimating apparent consumption, it has been assumed that copper used in primary fabrication of copper is consumed. Although the table aims to show primary consumption only, it should be noted that exports and stocks, as well as the import component of "total supply," include some refined secondary copper that cannot be determined separately. Actual consumption of new copper would also differ from the figures shown in the table by changes in consumers' stocks. The figures on apparent consumption in 1947 and 1948 are especially distorted by the fact that during this period unusual quantities of copper were imported as scrap and reexported in refined form. Because refined exports cannot be broken down to show new and old copper, these reexports were necessarily deducted from apparent consumption even though the scrap from which they were produced was not included in available supply.

TABLE 18.—New refined copper withdrawn from total year's supply on domestic account, 1946–50, in short tons

	1946	1947	1948	1949	1950
Production from domestic and foreign ores, etc	878, 662	1, 159, 970	1, 107, 446	927, 927	1, 239, 834
Imports [1]	154, 371	149, 478	249, 124	275, 811	317, 050
Stock at beginning of year [1]	130, 000	96, 000	60, 000	67, 000	61, 000
Total available supply	1, 163, 033	1, 405, 448	1, 416, 570	1, 270, 738	1, 617, 884
Copper exported [1]	52, 629	147, 642	142, 598	137, 827	144, 561
Stock at end of year [1]	96, 000	60, 000	67, 000	61, 000	26, 000
Total	148, 629	207, 642	209, 598	198, 827	170, 561
Apparent withdrawals on domestic account [2]	1, 391, 000	1, 286, 000	[3] 1, 214, 000	[3] 1, 072, 000	[3] 1, 447, 000

[1] May include some copper refined from scrap.
[2] Adjusted for Office of Metals Reserve stock changes; OMR stocks consigned to National Stockpile late in 1948.
[3] Includes copper delivered by industry to the National Stockpile.

The Bureau of Mines began to compile figures on actual consumption of refined copper in 1945. Details for 1948 to 1950, inclusive, are shown in table 19. Unlike table 18, in which all but new copper is eliminated so far as possible, table 19 does not distinguish between new and old copper, but covers all copper consumed in refined form.

Consumption by wire mills was notably higher in the period 1947 to 1950, compared with 1945 and 1946. In the latest 4-year period wire mills have regularly taken over half of the total refined copper used.

TABLE 19.—Refined copper consumed in 1948–50, by classes of consumers, in short tons

Class of consumer	Cathodes	Wire bars	Ingots and ingot bars	Cakes and slabs	Billets	Other	Total
1948:							
Wire mills	13	743, 403	22, 390			43	765, 849
Brass mills	79, 235	62, 454	92, 889	209, 861	169, 875		614, 314
Chemical plants	45		655		5	2, 524	3, 229
Secondary smelters	4, 847		1, 411	242	178	127	6, 805
Foundries and miscellaneous	1, 585	216	23, 530	67	355	4, 634	30, 387
Total	85, 725	806, 073	140, 875	210, 170	170, 413	7, 328	1, 420, 584
1949:							
Wire mills	19	[1] 605, 430	18, 230			34	[1] 623, 713
Brass mills	72, 777	45, 033	72, 559	163, 982	123, 656	119	478, 126
Chemical plants	19		72			1, 485	1, 576
Secondary smelters	3, 127		1, 011	250	65	10	4, 463
Foundries and miscellaneous	2, 595	183	14, 628	80	26	4, 296	21, 808
Total	78, 537	[1] 650, 646	106, 500	164, 312	123, 747	5, 944	[1] 1, 129, 686
1950:							
Wire mills	25	695, 817	17, 453	6		53	713, 354
Brass mills	130, 254	67, 379	104, 359	212, 353	160, 754	1	675, 100
Chemical plants	17		110			2, 995	3, 122
Secondary smelters	4, 584	192	1, 155	248		30	6, 209
Foundries and miscellaneous	1, 783	537	18, 198	70	426	5, 635	26, 649
Total	136, 663	763, 925	141, 275	212, 677	161, 180	8, 714	1, 424, 434

[1] Revised figures.

STOCKS

Industry stocks of metallic copper dropped in 1950, in contrast with the 1949 movement. Year-end inventories of refined copper were the lowest since 1906; unrefined stocks, however, remained at a more nearly normal level. Table 20 gives domestic stocks of copper as reported by primary smelting and refining plants. Blister and anode copper in transit from smelters to refineries are included with stocks of blister copper.

TABLE 20.—Stocks of copper at primary smelting and refining plants in the United States at end of year, 1945–50, in short tons

Year	Refined copper [1]	Blister and materials in process of refining [2]	Year	Refined copper [1]	Blister and materials in process of refining [2]
1945	130, 000	331, 000	1948	67, 000	183, 000
1946	96, 000	254, 000	1949	61, 000	261, 000
1947	60, 000	213, 000	1950	26, 000	232, 000

[1] May include some copper refined from scrap.
[2] Includes copper in transit from smelters in the United States to refineries therein.

The net drop during 1950 in producers' inventories of crude and refined copper combined was 20 percent. Only 10 percent of the end of 1950 total was in the form of refined copper, the remainder being in smelter shapes at smelters and in transit to refineries, and in smelter shapes and materials in process of refining at refineries.

Fabricators' stocks of refined metal (including in-process copper and primary fabricated shapes), according to the United States Copper Association, were 290,241 tons at the end of 1950 or 18 percent less than at the beginning of the year, continuing the downtrend since 1947. Working stocks (see table 21) were 288,392, or virtually unchanged from those at the end of 1949. After accounting for unfilled sales of metal, the deficiencies in stocks in relation to unfilled orders rose 181,911 tons to 218,831 tons at the end of 1950. The latter figure represented the largest deficiency since the end of 1946.

Figures compiled by the Copper Institute show that domestic stocks of refined copper decreased from 116,027 tons at the end of 1949 to 49,040 tons at the end of 1950. Inventory data of the Bureau of Mines and the Copper Institute always differ owing to somewhat different bases. Before 1947, a primary reason was that the Copper Institute coverage was limited to duty-free copper. The inclusion by the Copper Institute of all copper after January 1, 1947, reduced the differences chiefly to variations in interpretation. In the Bureau of Mines classification, cathodes to be used chiefly for casting into shapes are considered stocks in process and not refined stocks.

TABLE 21.—Stocks of copper in fabricators' hands at end of year, 1946–50, in short tons

[U. S. Copper Association]

	Stocks of refined copper [1]	Unfilled purchases of refined copper from producers	Working stocks	Unfilled sales to customers	Excess stocks over orders booked
1946	411,013	59,421	286,418	526,648	−342,632
1947	423,432	103,765	293,859	338,260	−104,922
1948	379,346	81,496	295,958	315,944	−151,060
1949	354,992	82,793	285,298	189,407	−36,920
1950	290,241	92,372	288,392	313,052	−218,831

[1] Includes in-process metal and primary fabricated shapes. Also includes small quantities of refined copper held at refineries for fabricators' account.

PRICES

Reports to the Bureau of Mines from copper-selling agencies indicate that 1,512,000 short tons of copper were delivered to domestic and foreign purchasers in 1950 at an average price (f. o. b. refinery) of 20.8 cents a pound—a 6-percent rise from the 19.7 cents in 1949 and 51 percent above the annual average for 1942–47. The averages for 1942–47 exclude bonuses paid under the Premium Price Plan for overquota outputs of individual mines. These were first applicable to February 1942 tonnages; the plan ended June 30, 1947. The history of the Premium Price Plan is given briefly in Minerals Yearbook, 1947 (pp. 466–468) and at greater length in Bureau of Mines Information Circular 7536.

TABLE 22.—Average monthly quoted prices of electrolytic copper for domestic and export shipments, f. o. b. refineries, in the United States, 1949–50, in cents per pound

Month	1949			1950		
	Domestic f. o. b. refinery [1]	Domestic f. o. b. refinery [2]	Export f. o. b. refinery [2]	Domestic f. o. b. refinery [1]	Domestic f. o. b. refinery [2]	Export f. o. b. refinery [2]
January	23.37	23.200	23.430	18.37	18.200	18.420
February	23.37	23.200	23.432	18.37	18.200	18.425
March	23.36	23.178	23.425	18.37	18.200	18.425
April	21.66	21.450	21.692	18.83	18.640	18.825
May	17.92	17.763	18.019	19.80	19.609	19.876
June	16.48	16.342	16.543	22.11	21.995	22.117
July	17.01	17.059	17.140	22.37	22.200	22.425
August	17.50	17.325	17.551	22.74	22.272	22.499
September	17.50	17.325	17.550	23.37	22.900	24.299
October	17.50	17.325	17.550	24.37	24.200	24.425
November	18.30	18.062	18.290	24.37	24.200	24.425
December	18.37	18.200	18.425	24.37	24.200	24.425
Average for year	19.36	19.202	19.421	21.46	21.235	21.549

[1] As reported by American Metal Market.
[2] As reported by E&MJ Metal and Mineral Markets.

TABLE 23.—Average yearly quoted prices of electrolytic copper for domestic and export shipments, f. o. b. refineries, in the United States, 1941–50, in cents per pound

	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Domestic f. o. b. refinery [1]	11.87	11.87	11.87	11.87	11.87	13.92	21.15	22.20	19.36	21.46
Domestic f. o. b. refinery [2]	11.797	11.775	11.775	11.775	11.775	13.820	20.958	22.038	19.202	21.235
Export f. o. b. refinery [2]	10.901	11.684	11.700	11.700	11.700	14.791	21.624	22.348	19.421	21.549

[1] As reported by American Metal Market.
[2] As reported by E&MJ Metal and Mineral Markets.

Under the stimulus of continued large and increasing demand, prices for electrolytic copper, delivered Connecticut Valley, advanced from 18.5 cents a pound at the beginning of the year to 24.5 cents at its end. There was an increase of 1 cent a pound on April 18 and of another cent on May 18. A 2-cent markup was made early in June, and another 2-cent rise to 24.5 cents occurred after mid-August, but all sellers did not immediately adopt the latter increase. It was not until October 2 that all primary factors were quoting 24.5 cents delivered Connecticut Valley (in case of Kennecott Copper Corp. delivered anywhere in the United States). Thereafter the price quotation continued unchanged for the remainder of the year.

The excise tax on copper became effective again on July 1, 1950. When reimposed, the tax amounted to 2 cents a pound on imported copper as against 4 cents before suspension. After July 1 customers were charged an additional 2 cents a pound for whatever foreign copper was used in filling their orders.

The price of export copper, f. o. b. refinery, was approximately 0.225 cent a pound above the domestic quotation through most of the year, but in September, when all producers failed to move to the higher price level for domestic copper, the average difference amounted to 1.399 cents.

London Price.—The prices of the British Ministry of Supply were raised similarly to those in the United States, although each increase carried the British price (converted to the equivalent in cents per pound) to about 1 cent above the United States price. A £16 per-ton drop immediately after the latest August rise, however, made the United Kingdom price temporarily lower than that in the United States. The price was £153 (equivalent to 19.1 cents a pound) a long ton on January 1, rose to £202 (equivalent to 25.25 cents) on August 22 (the highest sterling price on record), and dropped to £186 (equivalent to 23.25 cents) the following day. The price of £202 was reinstated effective September 1 and continued for the remainder of the year.

FOREIGN TRADE [4]

The long-term position of the United States in regard to copper was that of an exporting nation until World War II. For many years domestic mines produced far more copper than domestic industry could utilize. Domestic smelting and refining plants, moreover, had capacity to treat crude materials far over those coming from domestic sources; the excess capacity was used to smelt and refine imported copper under bond for reexportation in refined or manufactured forms. Much domestic copper as well was shipped for consumption in foreign markets. Starting in 1929, however, because of sharply reduced consumption the situation reversed, and the United States temporarily became a net importer, with the result than an excise tax of 4 cents a pound was imposed June 21, 1932, as a means of discouraging the entry of foreign copper into United States consumption channels. In 1933, the United States resumed its net export position. With the outbreak of World War II in Europe and the stepup of armament requirements there and elsewhere, the United States became a net importer of copper. During the war and just after, the Government was virtually the sole copper importing agent; at this time, the excise tax, not being applicable to Government purchases of "war material," was in effect suspended. After a brief period in which it was again applicable, the excise tax was suspended by acts of Congress, from April 30, 1947, to June 30, 1950. The suspended tax, meanwhile, was reduced as a result of the Trade Agreement negotiations at Geneva in 1947, to 2 cents a pound, effective March 16, 1949. The 2-cent tax finally came into effect on July 1, 1950, although several attempts were made in Congress to extend the suspension.

Much of the foreign copper currently entering the United States is exported after refining or after primary or later stages of fabrication. Much of the copper exported cannot be measured quantitatively, being in such items as electric motors, automobiles, and equipment of various types.

IMPORTS

Total imports of copper rose 25 percent in 1950, continuing the uptrend from the postwar low in 1946 and exceeding that year by 74 percent; they were, however, only 81 percent of the all-time peak in 1945. Refined copper accounted for 46 percent of total receipts and was 15 percent higher than in 1949. Partly refined copper (blister, etc.), second in importance of the import classes, rose 47 percent in 1950. Recently concentrates have gained in importance

[4] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

as a source of copper; but this class dropped 4 percent in 1950, and the unimportant ore class likewise fell. Imports of scrap, chiefly from Japan, had an outstanding increase, but the higher rate was not expected to continue. After supplying 52–70 percent of the total United States imports of unmanufactured copper in 1944–49, Chile fell to 42 percent of the total in 1950, although receipts from Chile increased slightly in that year. Receipts from Canada and Newfoundland were virtually unchanged, but this area's share of the total dropped from 15 to 12 percent. Rhodesia's share increased to 13, from 5 percent, with entries expanded to three times those in 1949. Mexico's tonnage and share of the total dropped, whereas Peru held its place, as imports therefrom rose 28 percent or similarly to the total.

TABLE 24.—Copper (unmanufactured) imported into the United States, 1941–45 (average) and 1946–50 [1]

[U. S. Department of Commerce]

Year	Short tons of contained copper	Year	Short tons of contained copper
1941–45 (average)	770,988	1948	507,449
1946	[2] 396,380	1949	[2] 552,709
1947	413,890	1950	690,231

[1] Data are "general" imports, that is, they include copper imported for immediate consumption plus material entering country under bond.
[2] Revised figure.

TABLE 25.—Copper (unmanufactured) imported into the United States, 1946–50,[1] in short tons, in terms of copper content [2]

[U. S. Department of Commerce]

	Ore	Concentrates	Regulus, black, or coarse copper and cement copper	Unrefined, black, blister, and converter copper in pigs or converter bars	Refined in ingots, plates, or bars	Old and scrap copper, fit only for remanufacture; and scale and clippings	Total
1946	4,895	41,844	[3] 777	193,387	154,371	1,106	[3] 396,380
1947	14,665	71,193	5,223	167,378	149,478	5,953	413,890
1948	8,197	81,301	3,657	155,836	249,124	9,334	507,449
1949							
Australia	650	289				2	941
Bolivia	992	3,675	4				4,671
Canada	283	27,271	518	29	47,930	2,794	78,825
Newfoundland-Labrador		3,934				62	3,996
Chile	3,695	19,104	199	51,770	210,443	175	285,386
Cuba	[3] 91	15,514				244	[3] 15,849
Ecuador	8	745	59				812
Japan					1,112	55	1,167
Malta, Gozo, and Cyprus		6,888					6,888
Mexico	271	11,167	739	51,053	1,468	8	64,706
Northern Rhodesia [4]		108	1	27,122		13	27,244
Peru	460	6,248	538	309	14,756	5	22,316
Philippines	([5])	[5] 7,910				59	7,969
Turkey				4,572			4,572
Union of South Africa	294	5,748	7	2,771		99	8,919
Yugoslavia				14,727			14,727
Other countries	79	213	19	23	102	3,285	3,721
Total	[3] 6,823	108,814	2,084	152,376	275,811	6,801	[3] 552,709

For footnotes, see end of table.

TABLE 25.—Copper (unmanufactured) imported into the United States, 1946–50,[1] in short tons, in terms of copper content [2]—Continued

[U. S. Department of Commerce]

	Ore	Concentrates	Regulus, black, or coarse copper and cement copper	Unrefined, black, blister, and converter copper in pigs or converter bars	Refined in ingots, plates, or bars	Old and scrap copper, fit only for remanufacture; and scale and clippings	Total
1950							
Australia	115	578				608	1, 301
Bolivia	297	4, 909	14				5, 220
Canada-Newfoundland-Labrador	124	24, 379	980		52, 099	4, 783	82, 365
Chile	1, 208	12, 143	424	64, 527	213, 604	159	292, 065
Cuba	18	22, 411				462	22, 891
Ecuador	24	616					640
France			124		135	3, 540	3, 799
Japan			163	595	27, 427	26, 215	54, 400
Malta, Gozo, and Cyprus		6, 530					6, 530
Mexico	27	9, 162	86	48, 660	4, 782	31	62, 748
Northern Rhodesia [4]		233		87, 062		5	87, 300
Norway					4, 098		4, 098
Peru	740	6, 578	905	5, 851	14, 428		28, 502
Philippines	([5])	[5] 10, 004				125	10, 129
Turkey				3, 266			3, 266
Union of South Africa	36	6, 475	10	3, 276		62	9, 859
Yugoslavia				10, 985		13	10, 998
Other countries	11	144	688		477	2, 800	4, 120
Total	2, 600	104, 162	3, 394	224, 222	317, 050	38, 803	690, 231

[1] Changes for table in Minerals Yearbook, 1947, p. 470, are as follows for 1946: Regulus imported from Canada, 205 tons; total 777 tons.
[2] Data are "general" imports, that is, they include copper imported for immediate consumption plus material entering the country under bond.
[3] Revised figure.
[4] Tonnages credited to Southern Rhodesia by the Department of Commerce have been added to Northern Rhodesia.
[5] Some copper in "Ore" and "Other" from Republic of the Philippines is not separately classified and is included with "Concentrates."

TABLE 26.—Copper (unmanufactured) imported into the United States, 1946–50, by countries, in short tons, in terms of copper content [1]

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
Australia	79	518	1, 570	941	1, 301
Belgian Congo	4, 469				103
Bolivia	4, 573	6, 752	6, 729	4, 671	5, 220
Brazil	69		1, 137	67	
Canada	[2] 27, 285	26, 484	43, 569	82, 821	82, 365
Newfoundland-Labrador	3, 254	3, 962	3, 698		
Chile	207, 525	223, 120	320, 703	285, 386	292, 065
Cuba	12, 378	14, 953	16, 270	[2] 15, 849	22, 891
Czechoslovakia		1, 096			
Ecuador	2, 978	190	482	812	640
France					3, 799
Japan		3, 226		1, 167	54, 400
Malta-Gozo-Cyprus			2, 689	6, 888	6, 530
Mexico	64, 684	75, 906	57, 593	64, 706	62, 748
Netherlands			791	234	352
Northern Rhodesia [3]	11, 682		19, 061	27, 244	87, 300
Norway					4, 098
Peru	30, 374	32, 597	19, 318	22, 316	28, 502
Philippines		2, 185	2, 252	7, 969	10, 129
Turkey	17, 414	1, 933		4, 572	3, 266
Union of South Africa	5, 396	9, 766	5, 926	8, 919	9, 859
United Kingdom	3, 386		995	1, 925	940
Yugoslavia		10, 317	2, 298	14, 727	10, 998
Other countries	834	885	2, 368	1, 495	2, 725
Total	[2] 396, 380	413, 890	507, 449	[2] 552, 709	690, 231

[1] Data are "general" imports, that is, they include copper imported for immediate consumption plus material entering the country under bond.
[2] Revised figure.
[3] Tonnages credited to Southern Rhodesia by the U. S. Department of Commerce have been added to Northern Rhodesia, inasmuch as copper of the grades reported does not originate currently in Southern Rhodesia.

Of the concentrates class, smaller imports came in 1950 from Canada and Newfoundland, Chile, and Mexico, but expanded tonnages came from Bolivia, Cuba, and the Philippines. Rhodesia's increased shipments of partly refined copper to the United States featured this class in 1950; Chile and Peru also sent greater tonnages, but Mexico, Turkey and Yugoslavia accounted for smaller quantities. Receipts of 27,427 tons of refined copper from Japan and of 4,098 tons from Norway were the highlights in this class, although entries from all other sources except Peru gained, and Peru maintained a steady tonnage.

EXPORTS

Most of the copper exported from the United States is in advanced forms of manufacture, in which the copper content is indeterminate, and in the form of refined copper. Shipments in refined form increased 5 percent in 1950. The United Kingdom received 51 percent of the total, France 13 percent, Italy 12 percent, India 6 percent, Netherlands 4 percent, and Switzerland nearly 4 percent; the remainder went to countries that each received 2 percent or less of the total. Of the foregoing countries, only the United Kingdom, with a gain of 183 percent, received more refined copper in 1950 than in 1949. Decreases of 4,000 tons or more each were indicated in shipments to France, Germany, India, Netherlands, and Switzerland and of over 1,000 tons each to Argentina, Austria, Brazil, and Italy. Denmark received 1,200 tons more and Norway 2,700 tons more. Foreign trade with Norway left a small balance in favor of the United States.

Exports of old and scrap were higher in 1950 than in 1949. All other export classes (rods, pipes and tubes, plates and sheets, and wire—insulated and other) showed marked declines in 1950.

TABLE 27.—Copper exported from the United States, 1941–45 (average) and 1946–50

[U. S. Department of Commerce]

Year	Ore, concentrates, composition metal, and unrefined copper (copper content)	Refined copper and semimanufactures	Total (except "Other copper manufactures")		Other copper manufactures [1]	Grand total
	Short tons			Value		
1941–45 (average)	942	206,788	207,730	$77,681,586	$1,646,665	$79,328,251
1946	23	97,475	97,498	37,114,211	1,472,662	38,586,873
1947	115	196,999	197,114	99,907,924	2,580,974	102,488,898
1948	2,473	207,022	209,495	111,313,040	2,249,857	113,562,897
1949	200	195,990	196,190	[2] 95,342,124	1,655,349	[2] 96,997,473
1950	616	192,339	192,955	86,934,184	1,502,917	88,437,101

[1] Weight not recorded.
[2] Revised figure.

23294—53——32

TABLE 28.—Copper exported from the United States, 1946–50,[1] in short tons

[U. S. Department of Commerce]

	Ore, concentrates, composition metal, and unrefined copper (copper content)	Refined in bars, ingots, or other forms	Rods	Old and scrap	Pipes and tubes	Plates and sheets	Wire and cable, bare	Wire and cable, insulated	Other copper manufactures
1946	23	52,629	2,452	909	2,931	3,687	4,499	30,368	(2)
1947	115	147,642	2,416	969	5,107	4,374	11,197	25,294	(2)
1948	2,473	142,598	8,101	2,266	5,246	2,853	10,694	35,264	(2)
1949	200	137,827	12,678	8,284	3,344	1,088	7,881	24,888	(2)
1950									
Algeria		1,174						13	
Argentina		110			49	13	1	150	
Austria		192		512		8	1	96	
Belgium-Luxembourg		578	146		59	(3)	18	56	
Brazil		1,356			19	(3)	401	41	
Canada-Newfoundland-Labrador	6	94	285	171	199	119	1,550	1,922	
Colombia	1	3	5		209	73	305	1,976	
Cuba	2	2	5		561	43	261	1,517	
Denmark	112	1,982	3,591		2			96	
France		18,401	112		1		1	164	
Germany		3,417		5,659		(3)		6	
Greece		309			26	4		78	
India	1	8,989	2	2,955	54	2	1	108	
Indonesia		(3)	(3)		4	2	21	212	
Israel	1	11	3		19	62	122	2,050	(2)
Italy		16,640		84	15		1,359	166	
Mexico	386	2	26		350	73	584	1,063	
Netherlands		6,148	5,830	28	1		44	12	
Norway		3,217			30		23	533	
Peru			1		24	20	36	520	
Philippines	3	2	(3)		41	12	269	1,560	
Saudi Arabia					1	2	18	139	
Switzerland		5,152	56		5	(3)	1	7	
Turkey		23	(3)		5	1	143	708	
Union of South Africa			(3)		16	2	681	149	
United Kingdom	101	74,245			4		2	35	
Venezuela	3	1	1		47	29	363	1,664	
Other countries		2,513	10	36	247	116	804	3,641	
Total:									
Short tons	616	144,561	10,073	9,445	1,988	581	7,009	18,682	(2)
Value	$222,592	$58,013,650	$4,358,276	$3,267,576	$1,946,204	$495,501	$3,455,523	$15,174,862	$1,502,917

[1] Changes in table in Minerals Yearbook, 1949, p. 481, are as follows: Wire and cable, bare, total value, $4,233,155.
[2] Weight not recorded.
[3] Less than 0.5 ton.

TABLE 29.—Unfabricated brass (ingots, bars, rods, shapes, plates, and sheets) exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons	Value	Year	Short tons	Value
1945	33, 810	$11, 850, 242	1948	6, 395	$4, 499, 160
1946	9, 030	3, 879, 189	1949	4, 287	3, 080, 509
1947	12, 622	7, 640, 678	1950	2, 334	1, 694, 488

TABLE 30.—Brass and bronze exported from the United States, 1949–50, by classes

[U. S. Department of Commerce]

Class	1949		1950	
	Short tons	Value	Short tons	Value
Ingots	794	$347, 903	531	$202, 641
Scrap and old	13, 963	4, 673, 525	9, 004	2, 635, 764
Bars, rods, and shapes	1, 563	1, 044, 606	866	652, 692
Plates and sheets	1, 930	1, 688, 000	937	839, 155
Pipes and tubes	1, 574	1, 522, 619	1, 029	1, 039, 860
Pipe fittings	696	1, 053, 459	814	1, 339, 570
Plumbers' brass goods	1, 571	3, 138, 067	1, 922	4, 009, 753
Wire of brass or bronze	1, 447	1, 596, 073	1, 153	1, 293, 773
Hardware of brass or bronze	(1)	980, 803	(1)	781, 063
Other brass or bronze manufactures	(1)	4, 518, 492	(1)	4, 394, 231
Total	(1)	20, 563, 547	(1)	17, 188, 502

1 Weight not recorded.

TABLE 31.—Copper sulfate (blue vitriol) exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons	Value	Year	Short tons	Value
1945	34, 967	$3, 419, 332	1948	42, 135	$6, 514, 960
1946	41, 345	4, 076, 850	1949	31, 717	4, 320, 726
1947	34, 021	4, 099, 551	1950	30, 149	4, 151, 265

WORLD REVIEW

World mine production of copper rose 11 percent in 1950, and the rate was the highest since 1944. Among leading copper-producing areas, Belgian Congo and Northern Rhodesia established new peaks, with gains of 24 and 15 percent, respectively, over 1949 and 6 and 12 percent over the previous high records in 1942 and 1940, respectively. Output in the United States increased 21 percent over 1949 and was the largest since 1944.

In Canada production was slightly less than in 1949, but otherwise at the highest level since 1944. Chilean production, in contrast, declined to the lowest rate since 1940.

TABLE 32.—World mine production of copper, 1944–50, in metric tons

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950
North America:							
Canada	248,145	215,416	166,892	204,897	218,387	239,003	237,603
Newfoundland	5,021	4,693	4,458	3,853	4,126		
Cuba	6,584	9,067	11,323	13,729	16,300	17,400	20,420
Mexico	41,302	61,680	61,054	64,811	59,076	57,246	61,699
United States	882,277	701,154	552,234	768,892	757,326	682,880	824,938
Total North America	1,183,329	992,010	795,961	1,056,182	1,055,215	996,529	1,144,660
South America:							
Bolivia [1]	6,170	6,097	6,127	6,241	6,616	5,074	4,704
Chile	498,520	470,181	365,034	426,671	444,949	371,095	360,515
Ecuador	[2] 3,720	[2] 3,289	[2] 2,699	166	474	704	526
Peru	32,396	31,916	24,592	22,492	18,068	27,959	29,930
Total South America	540,806	511,483	398,452	455,570	470,107	404,832	395,675
Europe:							
Austria	1,500	320	125	259	982	1,296	1,635
Finland	15,841	14,978	13,550	15,409	18,384	18,741	15,600
France	82	327	353	386	458	(3)	(3)
Germany: [4]							
Federal Republic	23,500	6,000	18,300	17,500	[5] 364	864	1,360
Soviet Zone					(3)	(3)	(3)
Hungary	[6] 750	(3)	160	[4] 300	(3)	(3)	(3)
Italy	363	2,177	136	135	30	6	34
Norway	14,462	5,203	12,249	14,707	15,112	14,875	15,400
Spain [7] [8]	11,000	8,300	8,600	6,454	5,503	6,702	6,802
Sweden	16,121	14,926	15,362	13,144	14,835	16,273	16,099
U. S. S. R. [4] [9] [10]	135,000	140,000	150,000	165,000	180,000	200,000	218,000
Yugoslavia [4] [10]	22,700	12,500	32,250	40,500	52,500	34,000	40,000
Total Europe [4] [9]	240,000	205,000	250,000	275,000	305,000	310,000	330,000
Asia:							
China [10]	[11] 1,030	623	947	915	472	1,874	[4] 4,000
Cyprus [1]	1,422	----------	71	12,681	15,735	23,936	23,301
India	6,706	6,230	6,060	5,462	6,316	6,305	7,000
Indonesia	60	(3)	(3)	(3)	(3)	----------	----------
Japan	[12] 86,842	27,984	17,173	21,892	25,765	32,741	39,322
Korea (South)	2,720	1,251	522	389	66	28	(3)
Philippines	(3)	(3)	----------	2,502	3,350	7,007	3,000
Taiwan (Formosa)	3,985	(3)	(3)	(3)	1,183	(3)	(3)
Turkey	[10] 11,050	[10] 9,858	[10] 10,050	[10] 10,080	12,367	13,130	13,300
U. S. S. R.	(9)	(9)	(9)	(9)	(9)	(9)	(9)
Total Asia [4] [9] [13]	116,000	48,000	37,000	56,000	67,000	85,000	90,000
Africa:							
Algeria	44	76	----------	----------	----------	----------	81
Angola	71	52	88	28	394	800	1,375
Belgian Congo [10]	165,484	160,200	143,885	150,840	155,481	141,399	175,920
French Morocco	635	43	60	67	518	360	18
Northern Rhodesia	225,685	199,337	191,546	197,288	226,472	259,084	297,487
Southern Rhodesia	100	157	145	174	131	80	117
South-West Africa	----------	----------	----------	[4] 3,100	8,270	9,622	10,961
Union of South Africa	22,869	24,016	27,004	29,330	29,450	30,454	33,982
Total Africa	414,888	383,881	362,728	380,800	420,716	441,799	519,941
Australia	28,506	24,914	18,040	13,334	12,567	13,678	14,500
World total [4] [13]	2,525,000	2,165,000	1,865,000	2,235,000	2,330,000	2,250,000	2,495,000

1 Copper content of exports.
2 United States imports.
3 Data not available; estimate by authors of chapter included in continental and world totals.
4 Approximate production.
5 American and British zones only.
6 January to June, inclusive.
7 According to Yearbook of American Bureau of Metal Statistics.
8 Starting in 1947 does not include content of pyrites shipped to foreign countries, the copper content of which may or may not be recovered.
9 Output from U. S. S. R. in Asia included with U. S. S. R. in Europe.
10 Smelter production.
11 Represents area designated as Free China during the period of Japanese occupation.
12 Fiscal year ended Mar. 31, 1945.
13 Includes estimates for Burma.

TABLE 33.—World smelter production of copper, 1944–50, in metric tons

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950
North America:							
Canada	[1] 224,049	[1] 198,427	[1] 151,434	179,997	200,736	205,098	217,853
Mexico	32,974	53,287	52,371	58,475	48,761	49,359	48,477
United States [2]	1,022,382	784,173	592,229	857,007	839,550	779,842	914,917
Total North America	1,279,405	1,035,887	796,034	1,095,479	1,089,047	1,034,299	1,181,247
South America:							
Chile	489,906	462,080	358,963	408,400	424,881	350,737	345,005
Ecuador [3]	3,708	3,285	2,659				
Peru	26,888	25,550	19,595	17,824	11,824	21,119	22,868
Total South America	520,502	490,915	381,217	426,224	436,705	371,856	367,873
Europe:							
Austria	6,051	1,454		378	2,143	3,761	5,133
Belgium [4]	4,310					(5)	(5)
Finland	6,756	13,686	20,952	21,087	20,672	18,224	13,572
France [6]	20	25	2	318	277	(5)	(5)
Germany:							
Federal Republic	[7] 24,000	[7] 18,200	[8] 38,809	[8] [9] 32,016	[8] [9] 62,244	[8] 145,536	[8] 200,648
Soviet Zone				(5)	(5)	(5)	(5)
Italy	231	2,181	7	105	167	30	54
Norway	937	1,692	7,549	7,920	8,935	9,306	9,338
Rumania	(5)	(5)	1,116	(5)	(5)	(5)	(5)
Spain	8,340	4,465	8,147	5,971	5,069	6,155	5,400
Sweden	15,062	18,249	14,471	14,258	17,180	14,359	16,708
U. S. S. R. [7] [10]	135,000	140,000	150,000	165,000	180,000	200,000	218,000
Yugoslavia [7]	22,700	12,500	32,250	40,500	52,500	34,000	40,000
Total Europe [7] [10]	225,000	215,000	275,000	305,000	365,000	445,000	525,000
Asia:							
China	[11] 1,030	623	947	915	472	1,874	[7] 4,000
India	5,822	6,096	6,412	6,426	5,957	6,493	6,720
Japan	[12] 102,352	45,737	23,043	36,812	54,330	74,037	84,749
Korea:							
North Korea	5,193	(5)	(5)	(5)	(5)	(5)	(5)
South Korea		427	527	392	514	308	(5)
Turkey	11,050	9,858	10,050	10,080	10,979	11,283	11,700
Total Asia [7] [10]	125,500	68,000	46,000	60,000	77,000	100,000	110,000
Africa:							
Belgian Congo	165,484	160,200	143,885	150,840	155,481	141,399	175,920
Northern Rhodesia	224,397	197,192	185,607	195,610	217,044	263,491	279,987
Union of South Africa	22,397	23,665	26,723	29,026	28,993	29,717	33,342
Total Africa	412,278	381,057	356,215	375,476	401,518	434,607	489,249
Australia	20,217	20,827	23,023	19,818	11,572	10,016	13,770
World total [7]	2,585,000	2,210,000	1,875,000	2,280,000	2,380,000	2,395,000	2,687,000

[1] Copper content of blister produced.
[2] Smelter output from domestic and foreign ores, exclusive of scrap. Production from domestic ores only, exclusive of scrap, was as follows: 1944, 910,245; 1945, 710,073; 1946, 543,996; 1947, 782,780; 1948, 764,278; 1949, 687,580; 1950, 826,760. The diversion during the war of Belgian Congo matte from its previous destination, Belgium, for resmelting in the United States results in some duplication. The movement ended in 1945.
[3] United States imports.
[4] Figures represent blister copper only. Belgium reports a large output of refined copper which is not included above as it is believed produced principally from crude copper from Belgian Congo and would therefore duplicate output reported under the latter country.
[5] Data not available; estimate by authors of chapter included in continental and world totals.
[6] Exclusive of material from scrap.
[7] Approximate production.
[8] Includes scrap.
[9] American and British zones only.
[10] Output from U. S. S. R. in Asia included with U. S. S. R. in Europe.
[11] Represents area designated as Free China during the period of Japanese occupation.
[12] Fiscal year ended Mar. 31, 1945.

Belgian Congo.—Conforming to the trend in most major copper-producing countries, copper production in Belgian Congo rose 24 percent in 1950, the largest percentage gain among the important copper areas. The rise, according to the Union Minière du Haut Katanga, only producer in the country, was made possible chiefly by the more normal rainfall during the year and by the commissioning of a new hydroelectric station. New electrolytic refining facilities have increased production capacity of electrolytic copper about 10,000 tons annually.

Belgium signed agreements with the Economic Cooperation Administration and the Export-Import Bank under which the country will receive a loan of $1,778,000 to help finance the initial stages of a major road development in Belgian Congo. The Congo road project is one phase of the Belgian Government's 10-year plan for the economic and social development of the African territory. The copper industry of Belgian Congo should benefit by the program.

Canada.—Mine production of copper fell 1 percent below 1949 but otherwise was the highest annual total since 1944. Refinery output rose 5 percent in 1950 continuing the up-trend in progress since the recent low in 1946. Refined-copper consumption was 106,868 tons in 1950 compared with 101,443 in 1949.

TABLE 34.—Copper produced (mine output) in Canada, 1946–50, by Provinces, in short tons [1]

Province	1946	1947	1948	1949	1950 (preliminary)
British Columbia	8,750	20,900	21,502	27,055	21,727
Manitoba	19,251	15,316	18,960	16,960	21,045
Newfoundland (not Canadian 1946–48)				3,617	3,057
Ontario	89,712	113,934	120,383	113,043	114,758
Quebec	34,899	42,561	48,813	67,822	72,826
Saskatchewan	31,356	33,151	31,074	34,960	28,501
Total	183,968	225,862	240,732	263,457	261,914

[1] Dominion Bureau of Statistics, Department of Trade and Commerce, Government of Canada, Preliminary Report on Mineral Production, 1950.

Ontario produced more than half of Canada's total for many years but fell to 43 percent in 1949 and 44 in 1950. The copper is derived from the nickel-copper ores of the Sudbury district; the International Nickel Co. of Canada, Ltd., is the outstanding producer in the Province and in Canada. Despite the company's importance as a copper producer, the principal value derived from the ore is from nickel, and the market for nickel is usually the dominant factor determining the rate of copper production. Accelerated open-pit output to fill World War II demands for nickel and copper has shortened the life of the pits. The company expects that surface deposits will be exhausted by 1953, but expanded underground operations to compensate for loss of pit ore are expected to lead to an output capacity of 13,000,000 tons of underground ore annually by that time. A major change is to involve the mining, by block-caving methods at the Creighton mine, of ores of lower grade than ever before. The new 6,000-ton mill at the Creighton is being enlarged and was planned to have a rated capacity of 10,000 tons by the end of 1951. The Murray mine was brought to a regular production basis during the year and by the end of the year was producing about 4,500 tons a day. Proved company reserves rose again in 1950 and stood at 252,859,725 short tons at the year end compared with 251,805,157 tons at its beginning. The nickel-copper content on December 31 was 7,669,219 tons compared with 7,630,099 a year earlier. The ore mined in 1950 was 9,849,024 tons compared with 9,984,891 in 1949, of which 5,733,269 and 5,015,318 tons, respectively, were underground, and 4,115,755 and 4,969,573 tons, respectively, open pit. The company delivered 106,474 tons of copper in 1950 and 110,538 in 1949, and 128,205 and 104,646 tons, respectively, of nickel in the same years. The company announced that oxygen flash smelting of copper concentrates would soon be in operation. A 300-ton-per-day oxygen generating unit and a new copper-concentrate smelting furnace of novel design were expected to be in operation before the end of the year; recovery of sulfur dioxide as a byproduct is a feature of the plant.

The Falconbridge Nickel Mines, Ltd.—the other important producer in Ontario—hoisted 881,838 tons of ore at the Falconbridge mine compared with 921,916 in 1949. Development ore at the McKim mine totaled 46,997 tons compared with 15,896 in 1949. The McKim was expected to begin regular production in 1951 and to reach full-scale operation by midyear. Reserves of developed ore were 9,369,000 tons averaging 1.60 percent nickel and 0.86 percent copper in the Falconbridge and McKim mines at the end of 1950; indicated ore reserves were 5,778,500 tons averaging 1.86 and 1.03 percent, respectively, in all Sudbury district holdings.

Quebec is regularly Canada's second most important copper Province. The largest producer here is Noranda Mines, Ltd., which operates the Horne mine. A total of 1,349,369 tons was hoisted in 1950, the largest tonnage since 1944. Copper production of 25,731 short tons, however, was slightly below 1949 and also under 1945. In addition, 202,453 ounces of gold and 572,080 ounces of silver were produced from Horne ore. Developed ore reserves above the 2,975-foot level were 16,590,000 tons averaging 2.22 percent copper and 0.186 ounce gold per ton, of which 4,031,000 tons averaged 7.05 percent copper and 0.157 ounce gold and 12,559,000 tons averaged 0.68 percent copper and 0.195 ounce gold. In addition to the 714,597 tons of Horne ore and concentrate the smelter treated 529,103 tons of custom material, which yielded 46,955 tons of copper.

At the end of 1950 the mill at the East Sullivan property was operating at close to maximum efficient capacity of 2,500 tons a day.

Production was begun at the property of Quemont Mining Corp., Ltd., in 1949, and 759,663 tons of ore were milled in 1950. The property, in which Noranda has a substantial interest, adjoins the Horne mine. Metal shipments were 11,634 tons of copper, 9,210 tons of zinc, 109,274 ounces of gold, and 412,007 ounces of silver. Copper concentrate goes to the Noranda smelter and zinc concentrate to the United States. As of January 1, 1951, reserves above the 2,340-foot level were 9,402,000 tons containing 1.43 percent copper, 2.87 percent zinc, 0.167 ounce gold, and 0.95 ounce silver to the ton.

The Normetal Mining Corp., Ltd., milled 363,297 tons of ore, averaging 2.45 percent copper, 8.08 percent zinc, 0.031 ounce gold, and 2.72 ounces silver in 1950. The copper concentrate is smelted at

Noranda; 58 percent of the zinc concentrate was shipped to the United States and the remainder to Belgium. Metals recovered were 7,853 tons of copper, 24,027 tons of zinc, 5,118 ounces of gold, and 491,798 ounces of silver. Ore reserves at the end of 1950 were 1,544,600 tons of ore averaging 3.37 percent copper and 7.41 percent zinc, and 28,500 tons of ore averaging 0.55 percent copper and 16.93 percent zinc.

At the property of the Waite Amulet Mines, Ltd. (controlled by Noranda), 424,365 tons of ore were milled and 12,936 tons of copper, 22,688 tons of zinc, 9,002 ounces of gold, and 373,398 ounces of silver produced. Ore reserves at the Waite mine were raised from 48,000 to 765,000 tons during the year owing chiefly to developments at "East Waite", where 700,000 tons averaging 4 percent copper and 3 percent zinc were in sight at the year end. Ore reserves of 1,123,186 tons at Amulet Dufault included 871,076 tons averaging 5.67 percent copper and 4.08 percent zinc, 52,110 tons averaging 1.11 percent copper and 6.02 percent zinc, and 200,000 tons averaging 2.75 percent copper and 0.6 percent zinc.

The Canadian Copper Refiners, Ltd. (controlled by Noranda), produced 123,200 tons of refined copper, compared with 111,100 tons in 1949.

At the Gaspé copper property of Noranda Mines, Ltd., 10,000,000 tons of ore was added to reserves. Reserves in Copper Mountain and in the upper zones in Needle Mountain average less than 1 percent copper, but 20,000,000 tons in the lower Needle Mountain zone average 2 percent. The total tonnage in the Gaspé property is now estimated at 57,000,000 tons, containing 1 percent copper.

Copper produced in *Saskatchewan* and *Manitoba* comes almost entirely from the Flin Flon mine of the Hudson Bay Mining & Smelting Co., Ltd., and the Sherridon operation of Sherritt Gordon Mines, Ltd. At the Hudson Bay mine 1,854,755 tons of ore was mined, of which 1,852,394 tons containing 2.24 percent copper, 4.6 percent zinc, 0.083 ounce gold, and 1.34 ounces silver per ton was milled; the concentrates therefrom—16,051 tons of direct-smelting ore from the stockpile and 41,496 tons of purchased concentrates—were treated for the production of 42,417 tons of copper, 48,944 tons of zinc, 130,041 ounces of gold, and 1,947,318 ounces of silver. Exclusive of custom production, company blister containing 42,632 tons of copper, 131,797 ounces of gold, 1,965,328 ounces of silver, and 142,242 pounds of selenium was shipped to the refinery. The company reported that no additional ore has been developed as yet in the lower levels of the mine but that geological conditions have not changed in depth and that a large amount of exploration work remains to be done. Reserves at the beginning of 1950 were reported as 20,157,000 tons, averaging 3.04 percent copper, 4.34 percent zinc, and 0.084 ounce gold and 1.14 ounces silver per ton.

In 1950, 375,592 tons of ore were hoisted by Sherritt Gordon Mines, Ltd., compared with 432,524 tons in 1949. The higher price for copper again extended the life of the West mine; and whereas no new ore was found, some marginal material became economic when mined with higher-grade reserves. Reserves at the end of the year were 128,431 tons, averaging 2.59 percent copper, 2.07 percent zinc, and 0.021 ounce gold and 0.62 ounce silver per ton. Production in 1950 was 7,337 tons of copper, 8,344 tons of zinc concentrates, 4,441 ounces of gold, and 135,339 ounces of silver. Plans for bringing the Lynn Lake property into production progressed during the year. This ore contains more nickel than copper, and the company plans to build a completely integrated plant, including a nickel refinery. Production annually of about 8,500 tons of refined nickel, 4,500 tons of copper, 300,000 pounds of cobalt, and 70,000 tons of ammonium sulfate is anticipated. To attain the foregoing output, initial production of about 2,000 tons a day from the two highest-grade ore bodies will be treated. Later on, as the lower-grade ore bodies are brought into production, the tonnage of ore treated will be increased to maintain metal output. Copper concentrates at first will be custom-smelted but will later be treated in the company's own refinery. Exploration work in 1950 added to Lynn Lake's reserves, which at the end of the year were 14,055,000 tons averaging 1.223 percent nickel and 0.618 percent copper.

Chief producers in *British Columbia* are the Granby Consolidated Mining, Smelting & Power Co., Ltd., and the Britannia Mining & Smelting Co., Ltd.

At the concentrator of Granby Consolidated Mining, Smelting & Power Co., Ltd., 1,799,853 tons of ore were treated. Company production was 12,743 tons of copper, 8,475 ounces of gold, and 173,424 ounces of silver compared with 17,847 tons of copper, 11,904 ounces of gold, and 255,931 ounces of silver in 1949. Rechecking previous estimates of tonnages and grade in various ore blocks resulted in a reduction in ore reserves to 5,530,000 tons of ore averaging 1–1.1 percent copper at the year end. At the end of 1949, reserves were reported to be 7,524,000 tons.

Exports of ingots, bars, and billets from Canada in 1950 as compared with 1949 were as follows, by countries of destination, in short tons:

Destination:	*1949*	*1950*
United Kingdom	59, 491	64, 325
United States	50, 212	50, 425
India	5, 741	6, 683
France	7, 403	5, 064
Netherlands	756	1, 871
Switzerland	1, 847	1, 867
Italy	98	1, 075
Brazil	790	858
Hong Kong	207	784
Other	615	1, 290
	127, 160	134, 242

Exports of copper in ore, matte, regulus, etc., totaled 32,299 (37,057 in 1949) tons, of which the United States was the destination of 25,495 (29,650) tons, Norway 6,118 (6,495) tons, the United Kingdom 686 (800) tons, and Belgium no (112) tons. In addition, 15,941 (31,529) tons of rods, strips, sheet, and tubing and 6,233 (3,514) tons of old and scrap copper, were shipped from the country.

Chile.—Mine output of copper decreased 3 percent in 1950, and smelter production fell 2 percent, continuing the declines from recent highs established in 1948. Production was interrupted several times by labor strikes, two of approximately 3 weeks' duration each occurring at the Chuquicamata mine and one at the Andes mine lasting from late August until October 1. Two or three other strikes of shorter duration affected production adversely. According to the annual report to stockholders of the Kennecott Copper Corp., martial law was imposed August 22, 1949, in all mining districts in Chile and was terminated in March 1950.

The Chuquicamata mine of the Chile Exploration Co., a subsidiary of the Anaconda Copper Mining Co., produced 172,286 short tons of copper compared with 193,001 tons in 1949. Deliveries were 183,695 and 196,575 tons, respectively, in the 2 years. Construction of the new metallurgical plant for treatment of sulfide ores which had been begun in 1949, progressed on schedule. The plant was made necessary by depletion of the oxide ores that have formed the basis of operations since they were begun in 1915. According to the company:

This plant, which will consist of a sulphide concentrator and a smelter, should be in full operation before the end of 1952. The concentrator will have capacity to treat 30,000 tons of sulphide and mixed ores per day. Each section consists of one 10 ft. x 14 ft. rod mill and one 10 ft. x 12 ft. ball mill with classifiers and 58 flotation cells. The smelter will contain three reverberatory furnaces each 35 ft. x 125 ft. and three 13 ft. x 30 ft. Pierce Smith Converters. The estimated output of this sulphide plant will be 300,000,000 pounds of blister copper per year.

During 1950 practically all of the excavation for the new Plant was completed, amounting to 1,900,000 cubic yards. A total of 24,000 tons of structural steel required for the Plant buildings, has been delivered and a substantial part of it has been erected. A gravity water pipe line with intake works, will be completed by April, capable of delivering 40,000 tons of water per day to the plant. Standard gauge electrified railroad lines for this project, totaling 12 miles, have been completed. 44 housing units for married members of the staff were completed and construction is now well under way on 545 additional houses for married workmen and their families. These units are in addition to accommodations built in 1949 for 950 single men.

The total estimated cost of the new Sulphide Plant is approximately $90,000,000. The expenditures on this project through December 31, 1950 totaled $44,836,645 of which $21,803,984 was expended during 1950.

At the Andes mine 49,869 tons of copper was produced compared with 53,473 tons in 1949.

At the Braden mine of the Kennecott Copper Corp. a total of 8,471,004 tons of ore, assaying 2.09 percent copper, was mined and milled. Smelter output was 157,910 tons compared with 139,592 tons in 1949. The company announced that the accelerated mine development program begun in 1949 had placed the mine in position to maintain normal production. The company stated: "The following economies were effected: (1) a saving in manpower was brought about by increasing the number of gathering dumps on the producing levels; (2) timber consumption has been greatly reduced through the changeover to modified sublevel caving; and (3) a considerable saving in upkeep was made by housing at Sewell the workers who formerly lived at the Teniente "C" camp." Snowfall greater by 55 percent than in 1949 virtually assured adequate water for normal operations during the winter months.

Chilean exports of the chief types of copper by countries, are shown in table 35. Other copper exports from Chile, all to the United States except as indicated, were 163 tons of ore, 16,005 tons of concentrates (415 tons to Germany), 341 tons of precipitates, 480 tons of cement copper, 766 tons of scrap, and 325 tons of remelted scrap bars (all to Argentina).

TABLE 35.—Principal types of copper exported from Chile in 1950, by countries, in metric tons

	Refined		Standard (blister)	Elongated wire bars	Total
	Electrolytic	Fire-refined			
United States	99,949	102,739	47,960		250,648
Italy	11,778	1,044	10,000		22,822
France	9,248	5,924	500		15,672
Brazil	10,577	1,749			12,326
Germany		3,402	3,734	1,086	8,222
Argentina		139		5,697	5,836
Poland			2,032		2,032
Denmark	51	1,422			1,473
Netherlands				597	597
Switzerland	584				584
Norway	526				526
Czechoslovakia		508			508
Belgium	102	127		100	329
Other countries	117	104			221
Total	132,932	117,158	64,226	7,480	321,796

France.—It is reported that a new company, Cie Générale d'Electrolyse du Palais, has been formed to lease the Palais-sur-Vienne electrolytic refinery near Limoges, France. The companies participating in the new concern are the Union Minière du Haut Katanga and its subsidiary (Société Générale Métallurgique de Hoboken—Belgium) and the French companies Cie Générale du Duralumin et du Cuivre (Cegedur), Cie. Francaise des Métaux and Tréfileries et Laminoirs du Havre. A minimum of 180,000 tons of rough copper in a 15-year period is guaranteed the refinery.[5]

Mozambique.—The Economic Cooperation Administration has granted Portugal aid to help solve the problem of traffic congestion at the port of Beira, long the principal outlet for mineral products of Northern and Southern Rhodesia, and to some extent of Belgian Congo. An advance of $950,000, as well as 4,250,000 Netherlands guilders (about $1,118,400), was granted from Marshall Plan counterpart funds. Copper is one of the chief items being shipped from Beira.

Northern Rhodesia.—Production of copper increased notably again in 1950, continuing the advance since 1946. Output thus established a new all-time high, exceeding the previous peak of 1940 by 12 percent. Nonetheless, continued rail-transportation difficulties that interfered with delivery of adequate supplies of coal prevented full attainment of production objectives. The copper companies, in conjunction with the Northern Rhodesian Government and the British South Africa Co., entered into an agreement to survey the coal resources of Northern Rhodesia, but, as late as November 1950, there were no indications of payable deposits. Burning of wood to supplement inadequate coal supplies increased still further in 1950. The Economic Cooperation Administration approved a technical assistance project to help the British Government make a preliminary survey in connection with the proposed construction of a railway link between Rhodesia and East Africa. The survey was to be financed jointly by ECA and the British Government; ECA was to pay the dollar costs, estimated at $40,000. Five members of the Anglo-American Corp. secured permission of the British Treasury to transfer their headquar-

[5]Metal Bulletin (London), No. 3531, October 6, 1950, p. 11.

ters offices from London to Northern Rhodesia. Substantial tax savings were to be realized by the move. The five companies were Rhokana Corp., Nchanga Consolidated Copper Mines, Rhodesia Copper Refineries, Rhodesian Anglo American, and Rhodesian Broken Hill Development.

A total of 3,366,500 short dry tons of ore, containing 2.38 percent copper, was mined at the Roan Antelope mine in the fiscal year ended June 30, 1950, or 10 percent above the previous fiscal year. Production of blister copper was 71,184 short tons compared with 62,901 short tons in the 1949 fiscal year. Ore reserves at the end of June 1950 were estimated at 93,317,965 tons, averaging 3.25 percent copper. The increase in reserves as compared with 1949 resulted from the thickness of ore in portions of the mine being greater than had been estimated from borehole information.

The Rhokana Corp., Ltd., produced 130,071 short tons of copper in the year ended June 30, 1950, of which 17,557 (13,734 in 1949) tons was Nkana blister copper, 39,866 (38,438 in 1949) Nchanga blister, and 72,648 (70,246 in 1949) Nkana electrolytic copper. Virtually the entire output in the next fiscal year will be electrolytic copper owing to anticipated completion of the extension of the Rhodesia Copper Refineries, Ltd. Ore reserves at the end of June 1950 were as follows:

	Short tons	*Copper (percent)*
Nkana north ore body	30, 700, 600	3. 10
Nkana south ore body	20, 165, 000	2. 78
Mindola ore body	52, 788, 000	3. 60
Total	103, 653, 600	3. 29

The over-all total was reduced during the year from 107,288,600 tons, averaging 3.35 percent copper.

The extension program at Nchanga—to increase production to about 64,000 long (nearly 72,000 short) tons—was reported to be nearing completion. Further expansion to 121,000 short tons, to be started immediately, was decided upon and planned for completion by the end of 1952. According to the Yearbook of the American Bureau of Metal Statistics for 1950, reserves at the Nchanga mine in 1950 were 138,391,954 short tons, averaging 4.66 percent copper.

The Mufulira Copper Mines, Ltd., mined 3,134,493 short tons of ore during the fiscal year ended June 30—a new record; of the 1949–50 tonnage, 56 percent was produced by block-caving methods. Blister-copper production was 86,294 tons, an increase of 9 percent over 1948–49. Construction of the company's electrolytic refinery was begun in April. Progress was said to be up to schedule, and the refinery was expected to start production of cathodes in the first half of 1952. Estimated ore reserves, as of June 30, were 162,822,000 tons, containing 3.89 percent copper.

Peru.—Mine output of copper rose from 27,959 metric (30,820 short) tons in 1949 to 29,930 metric (32,992 short) tons in 1950. The Cerro de Pasco Copper Corp. is by far the chief copper-producing company; it accounted for 22,868 metric (25,208 short) tons in 1950 of which 14,996 (16,530 short) was from corporation ores and 7,872 metric (8,677 short) tons from custom ores, compared with a total of 21,031 metric (23,183 short) tons in 1949, of which 13,010 (14,341) and 8,021 (8,842) tons, respectively, were from corporation and other ores. In addition to copper, the corporation produces noteworthy quantities of lead, gold, silver, and zinc concentrates. Lead and zinc outputs are making important gains, whereas copper production has decreased notably over a long period. Copper production from Cerro de Pasco ores in 1950 was little more than half of that in 1938. According to the corporation's annual report for 1950, half of the copper refinery at Huaymanta, near La Oroya, was converted to an electrolytic lead refinery, increasing the lead-refinery capacity to 160 tons a day, or to approximately the capacity of the existing lead smelter. The corporation has authorized extension of the Paragsha mill at Cerro de Pasco to increase daily capacity from 700 to 1,000 short tons of lead-zinc ores and an additional unit with an initial capacity of about 500 tons a day. The plan is to use the latter unit at first for flotation of copper ores from the Cerro de Pasco mine. Further expansion of this unit and its conversion to the flotation of lead-zinc ores are contemplated.

In 1949 the American Smelting & Refining Co. began an extensive churn- and diamond-drilling program on the Toquepala copper mine in southern Peru. This work was intensified in 1950. Exploration of the Quellaveco copper property, about 20 miles from Toquepala, was completed. The ore-reserve estimate showed a substantial tonnage, assaying slightly less than 1 percent copper. The entire tonnage at Quellaveco, was said to be susceptible to mining by open-pit methods, with a favorable stripping ratio. Consideration of placing either Toquepala or Quellaveco on an operating basis depends on completion of drilling at Toquepala and further investigations of power, water, railroad, and port facilities. Engineering studies in connection with these features are expected to require a long time.[6]

Philippines.—There was no output of copper in the Philippines in 1946, but production was resumed in 1947 and thereafter has increased each year, approaching pre-World War II levels in 1950. A report on reasons for the failure of the Philippine mining industry as a whole to reach prewar tonnages was recently published.[7]

The Lepanto Consolidated Mining Co. is the largest producer in the country. Operations at this property were described in a report which stated that the mill was handling 1,000 tons of ore averaging 4.5 percent copper daily. Metallurgical data for a recent month were as follows: Heads, 31,010 tons containing 4.12 percent copper and 0.128 ounce gold; tails, 26,810 tons, averaging 0.35 percent copper and 0.03 ounce gold; concentrates, 4,200 tons, containing 28.19 percent copper and 0.754 ounce of gold.[8]

Turkey.—The annual economic review of the United States Embassy at Ankara indicates that production of copper in Turkey rose from 11,300 metric tons in 1949 to 11,700 tons in 1950. The new concentrating plant at the Ergani mine went into partial operation in April and was in full operation by the end of the year. The crushing, flotation, and smelting plant at Murgul (Northeastern Turkey) was completed in 1950.

[6] Annual Report to Stockholders, 1950.

[7] Engineering and Mining Journal, Why Philippine Mining Hasn't Come Back: Vol. 152, No. 8, August 1951, pp. 80–83.

[8] Engineering and Mining Journal, Rebuilding Lepanto—The Far East's Largest Producer of Copper, pt. I: Vol. 152, No. 3, March 1951, pp. 72–75; pt. II: Vol. 152, No. 4, April 1951, pp. 110–113.

United Kingdom.—Consumption of copper increased 5 percent in 1950 to 521,998 long tons, of which 333,700 was virgin and 188,298 was scrap, from 496,720 tons in 1949, of which 318,736 was virgin and 177,984 scrap. Of the 1950 total, 303,833 tons was used as unalloyed copper, 204,427 was contained in brass or other alloyed form, and 13,738 tons in copper sulfate. The scrap tonnage includes processing scrap returned to mills of origin. Stocks of virgin blister and refined copper (held by the Ministry of Supply and consumers) dropped from 129,674 tons at the beginning of the year to 104,330 at the year end. These inventories include electrolytic (including rods), fire-refined, and blister copper on hand and in transit to the United Kingdom.

Two electrolytic copper refineries, one of 3,500 tons annual capacity and one of nearly 10,000 tons, were under construction during the year, and the latter began production. The smaller plant being erected at Widnes will treat rough copper produced there, and the larger (near Walsall) is operating on unalloyed and alloyed scrap.[9]

The British Ministry of Supply raised its price for unwrought copper £9 to £162 a long ton (equivalent to 20.25 cents a pound) on April 19, on May 18 to £164, and later the same day to £170 (21.25 cents). Further gains to £186 (23.25 cents) on June 9 and to £202 (25.25 cents) on August 22 were followed by rescinding of the latest rise on August 23. The price was returned to £202 effective September 1 and continued at this level for the remainder of the year. This is the highest sterling price ever recorded.

TABLE 36.—United Kingdom imports of copper in 1949–50, by country and class of copper, in long tons [1]

	1949			1950		
	Electrolytic	Standard	Total	Electrolytic	Standard	Total
Northern Rhodesia	36, 559	112, 887	149, 446	44, 387	105, 871	150, 258
United States	24, 132		24, 132	60, 791		60, 791
Canada	53, 267		53, 267	57, 202		57, 202
Belgium	21, 815		21, 815	23, 903		23, 903
Germany	18, 953		18, 953	14, 027		14, 027
Belgian Congo	17, 249		17, 249	9, 000		9, 000
Chile	1, 883	21, 960	23, 843	100	1, 833	1, 933
Other countries	1, 707	290	1, 997	556	279	835
	175, 565	135, 137	310, 702	209, 966	107, 983	317, 949

[1] Metal Statistical Digest, No. 43, January 1951, p. 2.

United Kingdom exports of copper in 1949 and 1950 were as follows (long tons):

	1949	*1950*
Ingots, etc	32, 113	23, 472
Plates, sheets, etc	9, 780	25, 620
Wire in coils	31, 378	29, 303
Tubes	6, 088	4, 777
Other manufactures	5, 143	2, 760
Total	84, 502	85, 932

According to the British Sulphate of Copper Association, Ltd., exports of copper sulfate from the United Kingdom increased to 43,391 long tons in the fiscal year 1949–50 from 34,988 tons in 1948–49.

[9] Metal Industry (London) Special Emergency News Bulletin: Vol. 77, No. 15, Oct. 13, 1950, p. 1. Mining World, vol. 12, No. 12, November 1950, p. 53.

A shortage of scrap might cause a drop in 1950–51, according to the association.

Yugoslavia.—It is reported that 40,000 tons of blister copper were produced in Yugoslavia in 1950. Although it had been feared that the Bor mine was nearing exhaustion, the report said that recent discoveries assured a considerable extension of life. A recently explored group of deposits, at Majdanpek, Eastern Serbia, containing ore of slightly over 1 percent copper and 0.5 to 2 grams gold per ton, was claimed to be second-largest in Europe. Geologists were searching for copper also in other parts of Yugoslavia—Macedonia, Bosnia, Herzegovina, and Montenegro. A new electrolytic refinery is under construction at the Bor mine and will have enough capacity for Yugoslavia's entire output. A modern copper rolling mill is being erected at Sevojno and is due to be completed in 1952. Its capacity is to be about 21,000 tons of finished products. A cable plant is under construction at Svetozarevo and is to produce all types of cables. The only existing cable plant, at Novi Sad, was said to be entirely inadequate to meet requirements of the Yugoslav electrification program.[10]

[10] American Metal Market, Bor Mine Produced 40,000 Tons Blister Copper in 1950: Vol. 58, No. 13, January 19, 1951, p. 4.

Feldspar

By Brooke L. Gunsallus and G. E. Tucker

GENERAL SUMMARY

CRUDE FELDSPAR production in 1950 increased 10 percent in tonnage and 12 percent in value over 1949. Ground feldspar increased 15 percent in quantity and 13 percent in value. The quantity of ground sales shipped to the pottery industry increased 25 percent, enamel industry 30 percent, and glass industry 6 percent in 1950 over 1949. Substitutes for feldspar in glass manufacture, such as aplite and nepheline syenite, held down the demand for ground feldspar in this industry. The large increase in sanitary ware, high-temperature electrical insulators, and whiteware manufacture was the reason for the unusually large demand for feldspar in the pottery industry. The demand for domestic appliances, such as stoves, washing machines, and refrigerators, and broader application of porcelain enamels in the construction field helped to increase the market demand for feldspar.

Imports of crude feldspar from Canada decreased 22 percent in 1950 compared with 1949. As American Nepheline, Ltd., closed its grinding plant at Rochester, N. Y., and shifted all grinding operations to Lakefield, Ontario, Canada, during 1950, the imports of crude nepheline syenite decreased 78 percent and imports of the ground product increased 189 percent in 1950 compared with 1949. Total imports of both crude and ground nepheline syenite for 1950 were 5 percent greater than in 1949. Total sales of aplite in 1950 increased very substantially over 1949, owing, in part, to the high level of glass-container production.

TABLE 1.—Salient statistics of the feldspar industry in the United States, 1940–44 (average), and 1947–50

	1940–44 (average)	1947	1948	1949	1950
Crude feldspar:					
Domestic sales:					
Long tons	316,275	459,910	460,713	369,378	407,925
Value	$1,559,673	$2,410,940	$2,564,357	$2,278,441	$2,558,390
Average per long ton	$4.93	$5.24	$5.57	$6.17	$6.27
Imports:					
Long tons	11,149	16,685	31,047	15,826	12,367
Value	$80,467	$124,587	$219,785	$107,925	$84,136
Average per long ton	$7.22	$7.47	$7.08	$6.82	$6.80
Ground feldspar:					
Sales by merchant mills:					
Short tons	329,385	482,700	506,451	386,707	446,523
Value	$3,565,610	$5,861,141	$6,462,231	$5,609,101	$6,343,619
Average per short ton	$10.83	$12.14	$12.76	$14.50	$14.21

DOMESTIC PRODUCTION

CRUDE FELDSPAR

Production of crude feldspar in 1950 increased 10 percent over 1949, and the total value increased 12 percent. The average value per ton was $6.27 compared with $6.17 in 1949. Eleven States reported production in 1950 compared with 13 in 1949. Wyoming and New York were the only States reporting in 1949 that did not report in 1950.

TABLE 2.—Crude feldspar sold or used by producers in the United States, 1945–50

Year	Long tons	Value		Year	Long tons	Value	
		Total	Average			Total	Average
1945	373,054	$2,021,529	$5.42	1948	460,713	$2,564,387	$5.57
1946	508,380	2,594,099	5.10	1949	369,378	2,278,441	6.17
1947	459,910	2,410,940	5.24	1950	407,925	2,558,390	6.27

TABLE 3.—Crude feldspar sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Long tons	Value	Long tons	Value	Long tons	Value
Colorado	62,497	$253,227	60,966	$341,049	59,457	$329,120
Connecticut	12,110	78,772	12,659	95,044	13,580	101,851
Maine	18,774	130,486	18,286	130,275	17,487	124,821
North Carolina	201,774	1,116,825	160,916	973,431	183,027	1,107,061
South Dakota	54,037	270,889	32,272	156,548	43,875	249,176
Virginia	34,770	231,607	33,936	234,442	26,879	188,153
Wyoming	16,760	78,080	(1)	(1)		
Undistributed[2]	59,991	404,501	50,343	347,652	63,620	458,208
Total	460,713	2,564,387	369,378	2,278,441	407,925	2,558,390

[1] Included with "Undistributed," in order to avoid disclosure of individual company operations.
[2] Includes Arizona, California, Georgia, New Hampshire, New York (1948–49), Texas (1949–50), and Wyoming (1949).

In comparison with output in 1949, the following large producing States showed decreases: Colorado, Maine, and Virginia. With the exception of California, all other States showed increases. The principal producer was North Carolina with 183,027 long tons (45 percent of total), Colorado was second with 59,457 long tons (15 percent of total), and South Dakota third with 43,875 long tons (11 percent of total).

GROUND FELDSPAR

Sales of ground feldspar by merchant mills in 1950 reached 446,523 short tons, an increase of 15 percent over 1949 but lower than in 1946, 1947, and 1948. The total value increased 13 percent over 1949, and the average selling price per ton was $14.21, a decrease of 2 percent. The number of producing States was 14, the same as in 1949.

TABLE 4.—Ground feldspar sold by merchant mills [1] in the United States, 1946–50

Year	Active mills	Domestic feldspar			Canadian feldspar			Total	
		Short tons	Value		Short tons	Value		Short tons	Value
			Total	Average		Total	Average		
1946	28	454,869	$5,029,330	$11.06	15,330	$316,777	$20.66	470,199	$5,346,107
1947	26	464,179	5,461,576	11.77	18,521	399,565	21.57	482,700	5,861,141
1948	28	487,070	5,991,059	12.30	19,381	471,172	24.31	506,451	6,462,231
1949	27	369,824	5,212,246	14.09	16,883	396,855	23.51	386,707	5,609,101
1950	23	429,787	5,952,019	13.85	16,736	391,600	23.40	446,523	6,343,619

[1] Excludes potters and others who grind for consumption in their own plants.

As has been the case for several years, North Carolina again was by far the largest grinder of feldspar, followed by Colorado, South Dakota, and Tennessee. Colorado was the only State among the large grinders to show a decrease in 1950; but production in the smaller producing States—California, New York, and Virginia—also declined. Increases were shown ranging from 18 percent for Connecticut-New Jersey to 25 percent for North Carolina-Tennessee and even higher for certain other States.

TABLE 5.—Ground feldspar sold by merchant mills [1] in the United States, 1948–50, by States

State	1948			1949			1950		
	Active mills	Short tons	Value	Active mills	Short tons	Value	Active mills	Short tons	Value
Colorado	2	81,049	$825,476	2	69,294	$727,989	2	62,879	$663,712
Connecticut	2	23,412	446,060	2	21,572	437,030	2	25,532	510,501
New Jersey	1			1			1		
Maine	3	20,789	347,492	3	16,742	295,227	3	19,938	352,809
North Carolina	4	219,720	2,377,030	4	159,768	2,203,604	3	200,373	2,526,268
Tennessee	2			1			1		
Undistributed [2]	14	161,481	2,466,173	14	119,331	1,945,251	11	137,801	2,290,329
Total	28	506,451	6,462,231	27	386,707	5,609,101	23	446,523	6,343,619

[1] Excludes potters and others who grind for consumption in their own plants.
[2] Includes (number of active mills in parentheses) Arizona (1), California (1 in 1949–50), Georgia (1), Illinois (1), New Hampshire (3 in 1948–49, 2 in 1950), New York (3 in 1948–49, 1 in 1950), South Dakota (3 in 1948, 2 in 1949–50), and Virginia (2).

The percentage of total shipments from several States was: Colorado, 14 percent (18 percent in 1949); North Carolina-Tennessee, 45 percent (41 percent in 1949); Connecticut-New Jersey, 6 percent; and Maine, 4 percent, the same as in 1949.

Campo Milling Corp. of Campo, Calif., purchased a feldspar mill formerly owned by American Radiator & Standard Sanitary Co. A froth-flotation section will be installed.[1] Feldspar Flotation Corp. built a new plant at Spruce Pine, N. C.[2] The Consolidated Feldspar Corp. closed its flotation plant at Parkdale, Colo., owing to develop-

[1] Rock Products, vol. 53, No. 7, July 1950, p. 47.
[2] Pit and Quarry, vol. 42, No. 7, January 1950, p. 97.

ment of feldspar sources nearer the Pacific-coast market.[3] In order to manufacture the finer grades of feldspar, the Appalachian Minerals Co., Monticello, Ga., installed a new pebble mill.[4]

CONSUMPTION AND USES

CRUDE FELDSPAR

Many merchant grinders also mine feldspar, either themselves or through affiliated firms. A large part of their supply of crude feldspar, however, is obtained from small operators who sell their product principally to the merchant mills. The tonnage of feldspar and feldspathic rock treated in flotation plants is increasing.

Most of the consumers of feldspar buy material already ground, sized, and ready for use in their products. Some pottery, enamel, and soap manufacturers, however, purchase all or part of their requirements crude and crush or grind it to their own specifications in their own mills. Some Canadian crude feldspar is purchased direct by consumers in this country. Manufacturers of artificial teeth annually consume a small tonnage of very carefully selected crude feldspar, which must be free from grit and is marketed at a considerable premium over No. 1 grade commercial feldspar.

GROUND FELDSPAR

The glass, pottery, and enamel industries consumed 99 percent of all ground feldspar in 1950 compared with a like amount in 1949 and 98 percent in 1948. In 1950, glass accounted for 48 percent; pottery, 44 percent; enamel, 7 percent; and other industries, including soaps and abrasives, the remaining 1 percent. Tonnage shipped to the enamel trade increased 30 percent, to the pottery industry 25 percent, and to glass manufacturers 6 percent. However, shipments to all other branches of industry using ground feldspar decreased about 3 percent in 1950.

TABLE 6.—Ground feldspar sold by merchant mills in the United States, 1948–50, by uses

Use	1948		1949		1950	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Ceramic:						
Glass	270,065	53.3	199,852	51.7	212,481	47.6
Pottery	202,905	40.1	158,218	40.9	197,817	44.3
Enamel	25,282	5.0	25,351	6.6	33,037	7.4
Other ceramic uses			30			
Soaps and abrasives	8,135	1.6	3,142	.8	3,028	.7
Other uses	64		114		160	
Total	506,451	100.0	386,707	100.0	446,523	100.0

The percentage of total consumption for the principal States in 1950 was as follows, the comparable 1949 figure being shown in parentheses: Ohio, 15 percent (14 percent); Pennsylvania, 13 percent

[3] Rock Products, vol. 53, No. 2, February 1950, p. 83.
[4] Rock Products, vol. 53, No. 1, January 1950, p. 86.

(15 percent); Illinois, 13 percent (13 percent); New Jersey, 12 percent (11 percent); West Virginia, 8 percent (8 percent); and Indiana, 7 percent (7 percent).

For the most part, shipments to all States held their own or increased in 1950 compared with 1949.

Names and addresses of merchant grinders of feldspar in the United States are listed below:

Abingdon Potteries, Inc., Abingdon, Ill.
Appalachian Minerals Co., Monticello, Ga.
Black Hills Tin Co., Tinton, S. Dak.
Carolina Mineral Co., Inc., Kona, N. C.
Clinchfield Sand & Feldspar Corp., 618 Mercantile Bldg., Baltimore, Md.
Consolidated Feldspar Corp., Trenton Trust Bldg., Trenton, N. J.
Eureka Mica Mining & Milling Co., Portland, Conn. (Eureka Flint & Spar Co., Inc., 190 West State St., Trenton, N. J., sales agent).
Feldspar Flotation, Inc., Spruce Pine, N. C.
Feldspar Milling Co., Burnsville, N. C.
Genesee Feldspar Co., 360 Boxart St., Rochester 12, N. Y.
Golding-Keene Co., 1401 New York Ave., Trenton, N. J.
J. F. Morton, Inc., P. O. Box 246, Bellows Falls, Vt.
North Carolina Feldspar Corp., Erwin, Tenn.
Northern Feldspars Corp., West Rumney, N. H.
Standard Flint & Spar Corp., New York Ave., Trenton 8, N. J.
Topsham Feldspar Co., Topsham, Maine.
United Feldspar & Minerals Corp., 10 East 40th St., New York 16, N. Y.
Western Feldspar Milling Co., 1333 W. Maple Ave., Denver, Colo.
Worth Spar Co., P. O. Box 763, Middletown, Conn.

Aplite

Carolina Mineral Co., Inc., Kona, N. C.
Dominion Minerals, Inc., Piney River, Va.

TABLE 7.—Ground feldspar shipped, by States of destination, from merchant mills in the United States, 1945–50, in short tons

Destination	1945	1946	1947	1948	1949	1950
California	8,735	8,641	7,395	8,406	8,385	(1)
Illinois	53,114	68,737	72,212	66,064	51,202	56,513
Indiana	47,321	47,756	44,864	37,774	25,962	28,875
Maryland	9,411	18,374	19,531	19,832	16,371	20,861
Massachusetts	3,258	3,009	3,906	4,437	1,944	5,733
New Jersey	35,735	41,340	43,969	52,587	44,243	53,430
New York	19,005	19,420	20,279	20,887	19,900	22,362
Ohio	48,151	47,031	63,939	64,805	52,533	68,186
Oklahoma	(1)	14,411	13,248	13,315	15,722	(1)
Pennsylvania	47,217	70,706	84,026	87,021	57,160	57,190
Tennessee	8,881	18,337	10,263	10,211	7,917	11,202
West Virginia	58,653	66,024	51,129	60,310	30,393	37,246
Wisconsin	7,058	10,317	9,958	11,741	10,749	12,580
Other destinations [2]	35,189	36,096	37,981	49,061	44,226	72,345
Total	381,728	470,199	482,700	506,451	386,707	446,523

[1] Included with "Other destinations"; separate figure for State not available.
[2] Includes Arkansas, California (1950), Colorado, Connecticut, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Oklahoma (1945 and 1950), Puerto Rico, Rhode Island, Texas, Washington, shipments that cannot be segregated by States, and small shipments to Canada, England, Mexico, and other countries. Also includes specified shipments to Alabama (1949), District of Columbia (1947), Florida (1949), Iowa (1947), Kansas (1948), Maine (1948 and 1950), and North Carolina (1947).

PRICES

Quotations on crude feldspar do not appear in the trade press. Average values are computed from the returns of producers reporting their output annually to the Bureau of Mines. In 1950 the average selling price per long ton for all feldspar mined in the United States was $6.27 compared to $6.17 in 1949 and $5.57 in 1948.

The average realization per short ton for ground feldspar in 1950 was $14.21, a decrease from 1949 of 2 percent. Of the larger producing States, the State having the highest average value per short ton was New Jersey ($25.23), followed by New York ($23.40) and Illinois ($20.74). The lowest average value per short ton was for Colorado ($10.56).

Quotations on ground feldspar appearing in E&MJ Metal and Mineral Markets reports for 1950 were the same as in 1948 and 1949 as follows: North Carolina, bulk carlots, 200-mesh, $18.50 per short ton; 325-mesh, $22.50; glass feldspar, No. 18, $12.50; and semi-granular, $11.75 (add $3.00 per ton to bulk quotation for bags and bagging). Virginia feldspar presented the same price picture in 1950 as in 1949, as follows: No. 1, 230-mesh, $18.50 per ton, and 200-mesh, $17.50; No. 17 glassmakers' feldspar, $11.75 and No. 18, $12.50. Enamelers' feldspar was listed at $15 to $17 throughout the year.

FOREIGN TRADE [5]

Imports for consumption of crude feldspar in 1950 totaled 12,367 long tons (all from Canada, except 1 ton from Norway) valued at $84,136. Compared with 1949, there was a 22-percent drop both in tonnage and value. This tonnage of crude feldspar imported is the smallest since 1944.

TABLE 8.—Feldspar imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Crude		Ground	
	Long tons	Value	Long tons	Value
1945	14,924	$114,917		
1946	16,365	127,517	[1]	$2
1947	16,685	124,587		
1948	31,047	$219,785	[1]	$328
1949	15,826	107,925		
1950	12,367	84,136		

[1] Less than 0.5 ton.

Ground feldspar exported from the United States, as reported by merchant grinders in 1950, totaled 4,069 short tons, a drop of 4 percent below 1949. Countries of destination were Mexico, Canada, France, United Kingdom, and Puerto Rico.

Cornwall Stone.—Unmanufactured Cornwall-stone imports for consumption for 1950 amounted to 1,128 long tons compared to 772 long tons for 1949. Imports of ground Cornwall stone were 111 long tons for 1950 compared with 20 long tons for 1949. The only source of imports, either crude or ground, is the United Kingdom.

[5] Figures on imports are compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 9.—Cornwall stone imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Unmanufactured		Ground		Year	Unmanufactured		Ground	
	Long tons	Value	Long tons	Value		Long tons	Value	Long tons	Value
1945	838	$11,317			1948	1,124	$15,633	117	$2,719
1946	456	6,031	80	$1,806	1949	772	11,200	20	572
1947	706	9,522	148	3,124	1950	1,128	11,792	111	2,160

NEPHELINE SYENITE

Nepheline syenite is a quartz-free crystalline rock consisting largely of nephelite and albite and microcline feldspar. Impurities may be iron-bearing minerals, such as black mica and magnetite, and other minerals, such as zircon and corundum. Used originally almost entirely in glass manufacture, substantial quantities now are consumed in making pottery.

Domestic Deposits.—Nepheline syenite occurs in New Jersey, Arkansas, and other localities in the United States, but all the domestic material found thus far in any appreciable tonnage has contained too much iron for ceramic purposes.

Uses.—The largest consumer of nepheline syenite is the glass industry, which favors its use because of its high alumina content. Body compositions have been readjusted in many divisions of the ceramic industry to take advantage of the results of extensive research in the use and application of nepheline syenite. In pottery it has been utilized extensively as a part of the body mix as well as in the glaze. The enamel industry, as well as floor- and wall-tile manufacturers, have found that in many applications firing range has been increased and lower maturing temperatures have resulted, with a saving in fuel costs, when nepheline syenite is used. A study has been made of the use of nepheline syenite and talc mixtures as a flux in low-temperature vitrified bodies.[6]

Prices.—Quotations on crude nepheline syenite are not reported in trade journals; however, the average values per ton of imports for consumption in the United States may be taken as an approximation of the crude values for this material. These were: 1945, $3.77; 1946, $3.98; 1947, $3.57; 1948, $4.01; 1949 and 1950, $4.07 per short ton. According to the Oil, Paint and Drug Reporter, quotations on ground nepheline syenite during 1950 were as follows: Glass grade (24-mesh), bulk, f. o. b. Rochester, N. Y., $14.25; and pottery grade (200-mesh), bulk, f. o. b. Rochester, N. Y., $18.25. Nepheline syenite in bags was $3.00 per ton higher than in bulk.

Foreign Trade.—Imports of crude nepheline syenite decreased 78 percent from 1949. Imports of ground nepheline syenite on the other hand increased 189 percent. The average value per ton (foreign market value) of ground nepheline syenite imported was $12.96 in 1950; Canada was the sole supplier of both crude and ground material.

[6] Lynch, E. D., and Allen, A. W., Nepheline Syenite-Talc Mixtures as a Flux in Low-Temperature Vitrified Bodies: Am. Ceram. Soc. Jour., vol. 33, No. 5, May 1, 1950, p. 99.

TABLE 10.—Nepheline syenite imported for consumption in the United States, 1945–50

[U. S. Department of Commerce

Year	Crude		Ground		Year	Crude		Ground	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1945	51,785	$194,975	1,073	$11,461	1948	53,570	$214,747	7,577	$130,860
1946	51,852	206,613	1,018	11,137	1949	41,215	167,567	18,779	248,224
1947	54,382	194,283			1950	8,966	36,453	54,242	703,008

Europe and Asia.—Deposits of nepheline syenite are known to exist in U. S. S. R. and have been tested for use in the ceramic industry, but production data are not available. Deposits in India and Finland have been reported but no development work has been recorded.

APLITE

The tonnage of aplite produced in 1950, as well as its value, show substantial increases over both 1948 and 1949. The only producers of aplite are Dominion Minerals, Inc., Piney River, Va., and Carolina Mineral Co., Inc., Kona, N. C. The operations are in Amherst and Nelson Counties, Va., near Piney River. The Bureau of Mines is not at liberty to publish production or sales data.

Research on aplite under way at the New York State College of Ceramics is reported to be making substantial progress. Indications are that aplite has wider prospective markets in the glass field.

TECHNOLOGY

An article on the use of colloidal aluminum phosphate as an ingredient in chinaware bodies containing 50 to 80 percent feldspar was published.[7]

Feldspar produced by froth flotation, the result of which is a spar with a lower iron content, is now being used on a wide scale. The product, containing 8 to 9 percent K_2O, is being successfully used in place of higher-K_2O feldspar through ceramic body readjustments.[8]

Four groups of body compositions for sanitary chinaware bodies involving partial replacement of feldspar by spodumene were investigated and some success was reported.[9]

---

[7] Journal of American Ceramic Society, vol. 33, No. 6, June 1950, p. 127.
[8] American Ceramic Society Bulletin, vol. 29, No. 4, April 1950, pp. 148–150.
[9] Journal of American Ceramic Society, vol. 33, No. 7, July 1950, p. 146.

A new product, feldspar-iron-alkali, as a Fischer-Tropsch catalyst has been developed (United States Patent 2,488,530). It is said to be particularly suited for catalyzing the synthesis of hydrocarbons in the reduction of carbon monoxide with hydrogen.[10]

The effect of varying the grinding procedure of feldspar and the partial and complete replacement of potash feldspar in a basic ceramic body with nepheline syenite and the addition of 2.5 to 5.0 percent of talc were studied. Nepheline syenite gave a fired body of lower quartz content and increased glass when used as the primary flux. Presence of talc was detrimental. Grinding up to 100 hours was found to be beneficial.[11]

Announcement has been made of the establishment of a 2-year cooperative research project at the Illinois Department of Ceramic Engineering, University of Illinois, Urbana, Ill., to investigate the applications of feldspar in the ceramic whiteware field.[12]

WORLD REVIEW

The estimated world production of feldspar in 1950 was 671,000 metric tons, an increase of 5 percent compared with 1949. The output of China and U. S. S. R., for which no data are available, is not included in the total.

The production of feldspar in the United States increased while other world production districts showed a general decrease. The ratio of United States output to estimated world output in 1950 was 62 percent compared with 59 percent in 1949. High-quality feldspar was discovered in Saskatchewan. It is said to have a low iron content, and the high alumina : silica ratio is advantageous in the manufacture of glass. The high potash : soda ratio qualifies it for use in ceramic-ware manufacture other than glass.[13] An excellent feldspar deposit on a highway and a railroad has been found in Angola (Portuguese West Africa).[14]

[10] Journal of American Ceramic Society, vol. 33, No. 6, June 1950, p. 132.
[11] Ceramic Industry, vol. 54, No. 5, May 1950, p. 36.
[12] American Ceramic Society Bulletin, vol. 29, No. 7, July 1950, p. 276.
[13] Northern Miner, vol. 36, No. 33, Nov. 9, 1950, p. 10.
[14] South African Mining and Engineering Journal, vol. 61, pt. 1, No. 2985, Apr. 29, 1950, p. 275.

TABLE 11.—World production of feldspar by countries [1], 1944–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Argentina (shipments)	3,468	5,375	4,755	5,000	(2)	(2)	(2)
Australia [3]	7,707	6,211	7,983	8,566	9,767	10,902	[4] 8,759
Austria	880	480	770	951	1,144	1,912	(2)
Brazil	(2)	(2)	(2)	(2)	189	(2)	(2)
Canada (shipments)	21,327	27,439	31,972	32,753	49,760	33,518	29,187
Chile	---	124	44	217	885	---	(2)
Czechoslovakia	(2)	5,944	7,171	(2)	(2)	(2)	(2)
Egypt	80	64	---	---	---	---	---
Eritrea	(2)	(2)	50	150	300	200	(2)
Finland	3,584	3,400	3,620	6,781	6,064	10,074	8,000
France	9,609	16,372	28,190	44,104	55,343	45,000	42,000
Germany: Federal Republic	41,200	(2)	[5] 18,000	21,251	32,921	49,544	(2)
India	343	340	1,304	1,750	1,003	863	(2)
Israel and Jordan	65	37	53	19	(2)	(2)	(2)
Italy	1,474	854	8,172	9,582	13,469	10,901	14,254
Japan	[6] 2,313	[6] 1,377	[7] 7,514	21,496	[8] 25,077	[8] 20,055	[8] 13,187
Kenya	(2)	110	44	36	10	20	(2)
Madagascar	34	---	12	---	---	(2)	(2)
Norway	7,987	4,244	5,332	22,140	33,117	[9] 21,932	[9] 20,846
Peru	---	330	174	29	210	(2)	(2)
Portugal	639	678	856	1,137	1,560	(2)	(2)
Southern Rhodesia	---	---	---	---	---	---	3,520
Spain (quarry) [10]	2,567	330	444	3,333	6,600	396	1,650
Sweden	15,537	15,172	25,276	37,953	38,687	38,959	(2)
Union of South Africa (sales)	669	635	1,382	1,676	2,101	3,259	5,147
United Kingdom: Northern Ireland	172	---	---	---	---	---	(2)
United States (sold or used)	332,663	379,042	516,539	467,292	468,107	375,307	414,472
Uruguay	264	[5] 265	513	843	4,877	811	710
Total [11]	465,000	500,000	675,000	700,000	768,000	640,000	671,000

[1] In addition to countries listed, feldspar is produced in China, Rumania, and U.S.S.R., but data are not available.
[2] Data not available; estimate by author of chapter included in total.
[3] Includes some china stone.
[4] Excluding South Australia.
[5] Estimate.
[6] Data for fiscal year ended March 31 of year following that stated.
[7] January to October, inclusive.
[8] In addition, the following quantities of aplite and other feldspathic rock were produced: 1948: 35,840 tons; 1949: 50,943 and 1950: 45,679.
[9] Exports.
[10] There is some additional production of feldspar, but comparable figures are not available.
[11] Estimated by author of chapter. No estimates included for countries listed in footnote 1, except Rumania.

Ferro-Alloys

Norwood B. Melcher

GENERAL SUMMARY

SHARP increases in both the production and shipment of ferro-alloys in 1950 reflected the general rise in steel production during the year, including the pick-up in the production of alloy steels. Imports of both ores and ferro-alloys increased, but domestic output of ores—notably manganese and chromium—failed to keep pace with increased production of ferro-alloys because of a lack of economically exploitable reserves and the difficulty of expanding existing operations very quickly.

Steel making generally, and the production of alloy steels in particular, depends on the availability of ferro-alloys. Hence, with few exceptions, these materials receive the highest priority as strategic materials and are on the National Stockpile list. The exceptions are silicon, phosphorus, titanium, and zirconium, which are considered the only ones available in adequate quantities for an emergency period. The rest are obtained largely from foreign sources. Silicon is produced in the United States and Canada in sufficient tonnages to meet all anticipated requirements, and the bulk of the vanadium requirement is obtained from domestic sources. The United States produces about 90 percent of the world supply of molybdenum, but the fact that a large portion of the United States supply of this metal is obtained from one large undergound mine requires this material to be given special consideration. The Defense Production Act of 1950 (Public Law 774, 81st Congress, 2d Session) among other things, authorized the Government to aid producers of minerals through purchase contracts, loans, and other means.

The ores of ferro-alloys are discussed in detail in the following chapters of this volume, dealing with particular metals: Chromium, Manganese, Molybdenum, Titanium, Tungsten, Vanadium, and Minor Metals.

PRODUCTION AND SHIPMENTS

The production of ferro-alloys in 1950 totaled 1,871,000 net tons, compared with 1,544,442 tons in 1949, an increase of 21 percent. From 1948 to 1949, however, production had decreased 18 percent, and 1950 production was still 1 percent under 1948 production. In 1950 ferro-alloys were made in 14 blast-furnace plants, 33 electric-furnace plants, and 2 aluminothermic-furnace plants. Shipments of all classes of ferro-alloys from furnaces increased 39 percent in quantity and 53 percent in value over 1949.

Pennsylvania again led all other States in production (30 percent) and shipments of ferro-alloys, accounting for 30 percent of the total United States shipments and 38 percent of the value, compared with 31 and 39 percent, respectively, in 1949. New York followed Pennsylvania, supplying 16 percent of the shipments and 20 percent of the value, while Ohio was third, with 14 percent of the shipments and 8 percent of the value. Production and shipments of ferro-alloys also were reported from Alabama, California, Florida, Illinois, Iowa, Kentucky, Montana, New Jersey, North Carolina, Oregon, South Carolina, Tennessee, Virginia, Washington, and West Virginia.

Of all the ferro-alloys, the only one that contains a high percentage of the rare alloying metal which is produced mainly in blast furnaces is ferromanganese, although the low-carbon ferromanganese is produced by electric methods. Spiegeleisen, the 20-percent-manganese material, is also produced by blast furnaces, as are the lower grades (under 13 percent) of ferrosilicon. Most of the molybdenum alloys and a small part of the ferrotitanium are produced by the aluminothermic process, where powdered aluminum is employed as a reducing agent.

TABLE 1.—Ferro-alloys produced and shipped from furnaces in the United States, 1949–50

Alloy	1949			1950		
	Production (net tons)	Shipments		Production (net tons)	Shipments	
		Net tons	Value		Net tons	Value
Ferromanganese	577,345	560,180	$86,463,708	719,680	731,421	$116,043,055
Spiegeleisen	78,167	53,888	2,972,653	42,375	65,163	3,875,823
Ferrosilicon	647,981	590,168	55,415,405	742,407	795,072	75,984,345
Ferrophosphorus	35,046	19,874	748,086	50,288	60,502	1,368,548
Ferrotungsten	1,376	1,091	2,690,343	721	1,064	3,818,904
Ferrotitanium; Ferrovanadium	5,528	6,179		8,772	9,411	
Ferromolybdenum; Molybdic oxide; Calcium molybdate and compounds	17,299	14,778	72,214,133	25,626	29,720	136,040,609
Other ferro-alloys [1]	181,700	178,704		281,131	289,863	
Total	1,544,442	1,424,862	220,504,328	1,871,000	1,982,216	337,131,284

[1] Silicomanganese, manganese briquets, ferrochromium, ferrocolumbium, ferroboron, zirconium-ferrosilicon, and miscellaneous ferro-alloys.

Ferromanganese.—The ferromanganese produced in 1950 averaged 76.96 percent manganese, a decrease of 1.37 percent from 1949, and came from six electric-furnace and eight blast-furnace plants; this was an increase of two electric furnaces over 1949. Of the manganese ore used in 1950 for manufacturing ferromanganese, 93 percent was foreign compared with 90 percent in 1949. During the year, 731,421 net tons were shipped from furnaces, whereas consumption totaled 774,852 tons, the difference being accounted for by the imported material. The steel industry consumed most of the ferromanganese in 1950, using 13.6 pounds of contained manganese per ton of steel ingots produced. High-carbon ferromanganese is satisfactory for the bulk of the steel production, but the low-carbon alloy is required in some alloy steels, for example, austenitic stainless steels, wherein carbon must be kept very low.

Over half of the ferromanganese imported in 1950 was produced in Norway, most of the balance being received from Canada and France. Only 3.7 percent came from the U. S. S. R.; and very small quantities came from Japan, Yugoslavia, Belgium-Luxembourg, Germany, Chile, United Kingdom, and Sweden.

This was the first year since 1939 that France exported ferromanganese to the United States.[1] Before 1939 French exports were small and sporadic, but shipments in 1950 averaged 1,300 net tons per month. The source of the manganese was French Morocco.[1]

TABLE 2.—Producers of ferro-alloys in the United States in 1950

Producer	Plant	Alloy
American Agricultural Chemical Co.	South Amboy, N. J.	Ferrophosphorus (byproduct).
Anaconda Copper Mining Co.	Anaconda, Mont. Black Eagle, Mont.	Ferromanganese.
Bethlehem Steel Co.	Johnstown, Pa.	Do.
Climax Molybdenum Co.	Langeloth, Pa.	Ferromolybdenum, calcium molybdate, molybdenum oxide, oxide briquets, molybdenum trioxide, sodium molybdate, ferrotungsten, nickel molybdenum, cobalt molybdenum, molybdenum sulfide.
Electro Metallurgical Co.	Alloy, W. Va. Ashtabula, Ohio Columbiana, Ohio Holcomb Rock, Va. Niagara Falls, N. Y. Portland, Oreg. Sheffield, Ala.	Ferromanganese, silicomanganese, manganese briquets, ferrosilicon, silicon briquets, zirconium-ferrosilicon, ferrochromium, chromium briquets, ferrotungsten, ferrovanadium, ferroboron, ferrocolumbium, ferrotitanium.
General Abrasive Co., Inc.	Niagara Falls, N. Y.	Ferrosilicon (byproduct).
Globe Iron Co.	Jackson, Ohio	Silvery pig iron.
Hanna Furnace Corp.	Buffalo, N. Y.	Do.
Jackson Iron & Steel Co.	Jackson, Ohio	Do.
Kaiser Aluminum & Chemical Corp.	Permanente, Calif.	Ferrosilicon.
Keokuk Electro-Metals Co.	Keokuk, Iowa Wenatchee, Wash.	Ferrosilicon, silvery pig iron.
E. J. Lavino & Co.	Reusens, Va. Sheridan, Pa.	Ferromanganese.
Metal & Thermit Corp.	Carteret, N. J.	Ferrotitanium.
Molybdenum Corp. of America	Washington, Pa.	Ferrotungsten, ferromolybdenum, molybdic oxide, ferroboron, manganese boride, calcium molybdate.
Monsanto Chemical Co.	Anniston, Ala. Columbia, Tenn.	Ferrosilicon (byproduct), ferrophosphorus (byproduct).
New Jersey Zinc Co.	Palmerton, Pa.	Spiegeleisen.
Ohio Ferro-Alloys Co.	Philo, Ohio Tacoma, Wash.	Ferrosilicon, simanal, ferrochromium.
Oldbury Electro-Chemical Co.	Niagara Falls, N. Y.	Ferrophosphorus (byproduct).
Pacific Northwest Alloys, Inc.	Mead, Wash.	Ferrosilicon, ferrochromium.
Pittsburgh Metallurgical Co.	Charleston, S. C. Niagara Falls, N. Y. Calvert City, Ky.	Ferrosilicon, silvery pig iron, ferrochromium.
Sloss-Sheffield Steel & Iron Co.	N. Birmingham, Ala.	Ferromanganese.
Tennessee Products & Chemical Corp. (Southern Ferro-Alloys Division).	Chattanooga, Tenn.	Ferromanganese, ferrosilicon, silicon briquets.
Tennessee Valley Authority	Muscle Shoals, Ala.	Ferrophosphorus (byproduct).
Titanium Alloy Manufacturing Division, National Lead Co.	Niagara Falls, N. Y.	Ferrotitanium, ferrocarbontitanium.
U. S. Steel Corp. subsidiaries	Clairton, Pa. Etna, Pa. Duquesne, Pa. Ensley, Ala.	Ferromanganese, spiegeleisen.
Vanadium Corp. of America	Niagara Falls, N. Y. Bridgeville, Pa.	Ferrosilicon, silicon briquets, alsifer, ferrochromium, ferrovanadium, ferrotitanium grainals, ammonium meta vanadate, titanium aluminum, chrome-silicon alloy, ferrocarbontitanium.
Victor Chemical Works	Mt. Pleasant, Tenn.	Ferrophosphorus (byproduct).
Virginia-Carolina Chemical Corp.	Nichols, Fla. Charleston, S. C.	Do.

[1] Foreign Commerce Weekly, vol. 39, No. 11, June 12, 1950, p. 36.

Spiegeleisen.—Production of this alloy continued to decline in 1950, dropping 46 percent from the previous year. Shipments, however, increased 21 percent, reflecting the general rise in steel production. Spiegeleisen is in effect a high- (15- to 30-percent) manganese pig iron containing 4.5 to 6.5 percent carbon and is made from the lower grade manganese ores; maintenance production would therefore conserve the higher-grade ores for the manufacture of ferromanganese. Spiegeleisen is used for essentially the same purposes as ferromanganese, but more time is required to melt and remove carbon from the product to introduce equivalent quantities of manganese metal to the steel.

Shipments of spiegeleisen from furnaces in 1950 totaled 65,163 tons valued at $3,875,823 f. o. b. furnaces, or $59.48 per ton compared with $55.16 per ton in 1949 and $48.29 in 1948. Three-tenths pound of manganese in the form of spiegeleisen was used per ton of steel in 1950.

Ferrosilicon.—From the standpoint of tonnage more ferrosilicon is still produced than any other ferro-alloy. Forty percent of the total ferro-alloy output in 1950 consisted of ferrosilicon compared with 42 percent in 1949; ferromanganese production was 38 percent of the total ferro-alloy production in 1950. Silvery pig iron, which is included in the ferrosilicon figures, is produced largely in blast furnaces and used chiefly by iron foundries, whereas the standard 50-percent ferrosilicon manufactured in electric furnaces is used in the manufacture of steel. In 1950, as in 1949, the blast-furnace product averaged 9.8 percent silicon while electric-furnace output—mostly ferrosilicon containing over 20 percent silicon—averaged 37 percent compared with 40 percent in 1949. Shipments of all grades of ferrosilicon (including silvery pig iron) totaled 795,072 net tons valued at $75,984,345. The 50-percent-silicon grade is the most important and is used as a deoxidizer in the production of most grades of killed and semikilled steel. Only a small quantity of ferrosilicon is used by iron foundries and other industries. Alloys containing 75 percent silicon and miscellaneous silicon alloys are used as ladle additions in gray-iron foundries and in manufacturing of silicon electrical steels and high-silicon spring steel.

Ferrophosphorus.—Although ferrophosphorus may be produced in the blast furnace or the electric furnace, all ferrophosphorus in 1950 was produced in electric furnaces as a byproduct in the manufacture of phosphate fertilizers and other chemicals. Ferrophosphorus is used primarily as an addition agent in manufacturing certain open-hearth sheet steels to prevent sticking of sheets on packrolling. Shipments of ferrophosphorus increased threefold from 1949 but failed to reach the 1948 amount in spite of a 43-percent increase in production. Exports of ferrophosphorus recovered to large extent in 1950 from the precipitous drop in the previous year, reaching 42,789 net tons valued at $868,480, but were still under the record high of 52,988 tons valued at $1,310,260 attained in 1948.

Ferrotungsten.—The ferrotungsten produced in the United States during 1950 was made in electric furnaces from both foreign and domestic ores. The total consumption of tungsten concentrates in the United States during the year was 6,931 net tons (60 percent WO_3 basis), 1,165 tons of which were consumed in manufacturing ferrotungsten. The domestic material was obtained from five States and Alaska in 1950, but three States—California, North Carolina, and Nevada—supplied 92 percent of the total. Imports for consumption of tungsten ores and concentrates in 1950 were equivalent to 16,550 net tons of 60 percent WO_3, a 151-percent increase over 1949. These ores and concentrates came from 22 foreign countries in 1950 but supplied 65 percent of the total.

Ferrochromium.—All ferrochromium produced in the United States in 1950 was made in electric furnaces, chiefly from foreign ores. Ferrochromes are divided into two main classes—high-carbon, containing 65 to 70 percent chromium with carbon contents ranging from maximum 4.5 percent carbon to maximum 8.5 percent in the various grades, and low-carbon, containing 67 to 72 percent chromium with carbon ranging from maximum 0.03 percent to maximum 2.00 percent. Special ferrochromes, such as nitrogen-bearing and silicon-manganese ferrochromes, are also manufactured for special uses. The low-carbon grades of ferrochromium are used in the stainless steels and high-temperature alloys, which contain relatively high percentages of chromium and low percentages of carbon, and the high-carbon grades in other types of chromium-bearing steels. Consumption of ferrochromium in the United States in 1950 was 147,911 net tons compared with 87,764 tons in 1949 and 122,753 tons in 1948. This consumption was reported by consumers that normally use about 85 percent of the total. Imports were three times the 1949 figure, while exports dropped from 2,200 net tons to 347.

Ferromolybdenum.—The ferromolybdenum produced in 1950 was made by the aluminothermic and electric furnace processes and used domestic concentrates. The alloy was produced in only two plants during the year.

Molybdic Oxide, Calcium Molybdate, and Other Molybdenum Compounds.—Molybdenum compounds used in alloying agents in the production of iron and steel are included with ferro-alloys. These materials are used more extensively than ferromolybdenum because of their lower cost. As in the case of ferromolybdenum, virtually all of these compounds are made from domestic raw materials.

Ferrotitanium.—Most of the ferrotitanium in 1950 was produced in electric furnaces, but a small quantity was made by the aluminothermic process. The ferrotitanium produced in 1950 contained a higher percentage of titanium than in the preceding year, the average of all grades in 1950 being 24.0 percent Ti compared with 23.4 percent in 1949. Both foreign and domestic ores of titanium (ilmenite and rutile) were consumed in its manufacture. A number of grades of ferrotitanium are available for use in steel making. The low-carbon grades are used chiefly in manufacturing stabilized, austenitic stainless steels to render them resistant to intergranular corrosion in service. The high-carbon grades are used as deoxidizers and scavengers. In medium- and high-carbon killed steels the higher-carbon varieties of ferrotitanium are used as the final deoxidizer to prevent segregation and the occurrence of objectionable inclusions and in some cases to control grain size.

Ferrovanadium.—All ferrovanadium produced in 1950 was made in electric furnaces from both foreign and domestic ores. This alloy averaged 53 percent vanadium in 1950, compared with 50 percent in 1949 and 48 percent in 1948. Up to 0.10 to 0.25 percent of vanadium is added to engineering steels—usually to the ladle in open-hearth practice and to the furnace in basic electric practice. In high-speed steels the percentage ranges from approximately 1.00 to 2.50 percent, and some steels are made with a higher vanadium content. Vanadium is also employed to prevent age hardening in low-carbon rimmed steels.

Ferrocolumbium.—Columbium is used chiefly in manufacturing stabilized austenitic stainless (Cr-Ni) steels. It is also employed to reduce the air hardening characteristic of straight-chromium steels of the corrosion-resistant type. In 1950 the output of ferrocolumbium averaged 56 percent columbium compared with 57 percent in 1949 and was produced in electric furnaces.

Zirconium-Ferrosilicon.—The zirconium-ferrosilicon produced in 1950 averaged 14 percent Zr, as in the previous year. Zirconium, a deoxidizer and scavenger, combines readily with oxygen, nitrogen, and sulfur, eliminating them from the steel bath or minimizing their effect. Formation of zirconium nitride reduces age hardening in deep-drawing steels; and the formation of zirconium sulfide, as with manganese sulfide, diminishes hot shortness. The addition of over 0.10 percent zirconium to steels usually results in grain refinement. The alloy is used in place of ordinary ferrosilicon but is more effective for the purposes stated.

Silicomanganese.—Silicomanganese averaged 67 percent manganese in 1950. This alloy is used to introduce manganese into low-carbon killed steels because of its low carbon-manganese ratio.

Manganese Briquets.—Manganese briquets are made from ferromanganese or silicomanganese that has been crushed and bonded into briquets of convenient size. The foundry industry is the principal user of manganese briquets, which are added to molten iron as a deoxidizer and scavenger. Each of these briquets contains exactly 2 pounds of manganese, therefore the required amount of manganese can be added without weighing the material.

FOREIGN TRADE[2]

Ferromanganese continued to be the chief ferro-alloy import in 1950. Most of this alloy was received from Norway, Canada, and France and was manufactured from ores exported from Gold Coast and French Morocco. Hence, receipts of manganese in the form of alloy must be taken into account in considering receipts of ore from Gold Coast. The alloy received from these countries in 1950 was equivalent to 172,274 tons of manganese ore.

The over-all figure for exports of ferro-alloys in 1950 increased markedly over that for 1949 because of an eightfold increase in exports of ferrophosphorus. Exports of other ferro-alloys declined.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 3.—Ferro-alloys and ferro-alloy metals imported for consumption in the United States, 1949–50, by varieties

[U. S. Department of Commerce]

Variety of alloy	1949			1950		
	Gross weight (net tons)	Content (net tons)	Value	Gross weight (net tons)	Content (net tons)	Value
Calcium silicide	56	(1)	$14,977	246	(1)	$11,479
Chromium metal	-------	-------	-------	59	(1)	88,057
Ferrochrome or ferrochromium:						
Containing 3 percent or more carbon	[2] 7,366	[2] 3,937	[2] 1,260,193	21,633	12,740	4,167,546
Containing less than 3 percent of carbon	[2] 124	[2] 75	[2] 19,405	1,493	1,028	362,701
Ferrochromium tungsten, chromium tungsten, and chromium cobalt tungsten (tungsten content)	-------	-------	-------	(1)	(3)	4,222
Ferromanganese:						
Containing not over 1 percent carbon	(4)	(5)	89	372	302	109,466
Containing over 1 and less than 4 percent carbon	16,059	13,369	4,117,462	23,440	19,304	5,059,189
Containing not less than 4 percent carbon	48,955	38,798	7,188,058	86,136	67,887	11,069,120
Ferrosilicon	7,437	931	254,831	14,742	3,785	797,588
Ferrosilicon-aluminum, ferro-aluminum silicon, and alsimin	-------	-------	-------	(6)	(1)	80
Ferrotitanium	138	(1)	20,280	130	(1)	81,236
Ferrotungsten	31	23	30,813	880	690	1,078,760
Ferrovanadium	-------	-------	-------	65	(1)	91,193
Manganese-boron, manganese metal, and spiegeleisen not more than 1 percent carbon (manganese content)	(1)	3	1,225	(1)	57	16,614
Manganese silicon	-------	-------	-------	(1)	142	25,794
Silicon-aluminum and aluminum-silicon	125	(1)	35,929	-------	-------	-------
Silicon metal (silicon content)	34	32	17,043	(7)	(7)	517
Spiegeleisen	1,737	(1)	86,217	8,595	(1)	474,259
Tungsten and combinations, in lump, grains, or powder:						
Tungsten metal (tungsten content)	(1)	7	21,811	(1)	105	322,131
Tungsten carbide (tungsten content)	-------	-------	-------	(1)	(7)	164
Combinations containing tungsten or tungsten carbide (tungsten content)	-------	-------	-------	(1)	(8)	80
Tungsten nickel, and other compounds of tungsten, n. s. p. f. (tungsten content)	-------	-------	-------	(1)	(9)	132
Tungstic acid and other alloys of tungsten, n. s. p. f. (tungsten content)	-------	-------	-------	(1)	2	1,720

[1] Not recorded.
[2] Revised figure.
[3] 134 pounds.
[4] 441 pounds.
[5] 370 pounds.
[6] 1,000 pounds.
[7] 1 pound.
[8] 40 pounds.
[9] 32 pounds.

TABLE 4.—Ferromanganese and ferrosilicon imported for consumption in the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	Ferromanganese (manganese content)				Ferrosilicon (silicon content)			
	1949		1950		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Belgium-Luxembourg			169	$28, 133	(1)	$6		
Canada	25, 783	$4, 762, 495	19, 100	3, 315, 823	931	254, 825	3, 699	$787, 241
Chile			87	14, 494				
China	9	1, 407						
France			15, 533	2, 578, 054				
Germany			95	26, 636				
Japan	11	2, 543	504	80, 467			86	10, 347
Korea	44	4, 670						
Norway	26, 320	6, 534, 494	48, 378	9, 542, 794				
Sweden			44	11, 160				
U. S. S. R.			3, 215	574, 080				
United Kingdom			45	12, 464				
Yugoslavia			323	53, 670				
Total	52, 167	11, 305, 609	87, 493	16, 237, 775	931	254, 831	3, 785	797, 588

[1] Less than 0.5 ton.

TABLE 5.—Ferro-alloys and ferro-alloy metals exported from the United States, 1946–50, by varieties

[U. S. Department of Commerce]

Variety of alloy	1946		1947		1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value	Net tons	Value
Spiegeleisen	7, 513	$271, 827	305	$12, 632	51	$2, 227			363	$21, 351
Ferrochrome	2, 510	732, 221	3, 081	1, 057, 359	6, 754	2, 371, 367	2, 200	$942, 792	347	134, 341
Ferromanganese	2, 951	381, 194	20, 168	2, 811, 653	19, 696	2, 990, 645	6, 627	1, 360, 279	580	139, 876
Ferromolybdenum	370	456, 574	477	630, 813	594	806, 420	478	718, 722	589	927, 271
Ferrophosphorus	1, 228	80, 037	34, 535	919, 877	52, 988	1, 310, 260	5, 050	168, 205	42, 789	868, 480
Ferrosilicon	3, 163	244, 625	1, 357	187, 973	2, 476	427, 259	2, 555	436, 402	1, 983	242, 245
Ferrotitanium and ferrocarbon-titanium	550	63, 723	509	80, 590	480	82, 874	179	40, 918	171	42, 741
Ferrotungsten	91	270, 325	41	134, 546	628	1, 838, 397	310	861, 189	166	408, 958
Ferrovanadium	57	161, 289	89	266, 040	119	390, 428	97	350, 558	41	183, 307
Other ferro-alloys	218	61, 489	206	88, 289	183	102, 709	316	161, 297	88	31, 969
Total	18, 651	2, 723, 304	60, 768	6, 189, 772	83, 969	10, 322, 586	17, 812	5, 040, 362	47, 117	3, 000, 539

Fluorspar and Cryolite

By Hubert W. Davis

GENERAL SUMMARY

RECORD consumption and imports, wage increases, higher prices, abrogation of the reciprocal trade agreement with Mexico, and transfer of acid-grade fluorspar to the list of strategic and critical materials for stockpiling were some features of the fluorspar industry in 1950.

Although shipments of fluorspar from mines in the United States gained 27 percent over 1949, they were 9 percent less than the peacetime record in 1948 and fell far short of meeting industry's requirements. The deficit was met by imports, which were 72 percent greater than in 1949. The high level of operations in the steel and hydrofluoric-acid industries and a 26-percent gain in consumers' stocks were chiefly responsible for the accelerated activity in fluorspar in 1950.

Illinois maintained its rank as the premier producer of fluorspar in 1950 by supplying 51 percent of the total domestic shipments. Moreover, shipments from Illinois were 28 percent greater than in 1949. Arizona, Kentucky, Nevada, New Mexico, and Utah also shipped more fluorspar than in 1949, but Colorado, Montana, and Texas shipped less. Shipments from Utah established a new record.

For the tenth consecutive year, Mexico was the largest supplier of foreign fluorspar to the United States. Although it supplied proportionately less in 1950 than in recent years, imports from that source were 25 percent greater than in 1949 and were the second highest on record. Also noteworthy were the much larger imports from Spain and the receipt of 29,624 tons from Germany.

The steel industry, which set a new production record in 1950, continued to be the predominant user of fluorspar but absorbed proportionately less (56.5 percent) of the total consumed in 1950 than in 1949 (58.4 percent). Use by the industry was 20 percent greater than in 1949, but, because of the smaller utilization of fluorspar per ton of steel made, its total consumption of fluorspar fell short of the record made in 1942. The average consumption of fluorspar per long ton of basic open-hearth steel produced was 5.5 pounds in 1950 compared with 5.8 pounds in 1949 and 6.4 pounds in 1942. The hydrofluoric-acid industry, the second-largest utilizer of fluorspar, consumed 40 percent more than in 1949 and accounted for 29 percent of the total in 1950 compared with 26 percent in 1949. Consumption of fluorspar by the glass and enamel trades in 1950 reversed downward trends that had persisted for 2 years.

Deliveries of fluorspar to consumers in the United States totaled 463,319 short tons in 1950 (300,782 tons from domestic mines and

232294—53——34

162,537 tons from foreign sources). In 1949 deliveries to consumers totaled 325,780 tons (235,921 tons from domestic mines and 89,859 tons from foreign sources). Total deliveries to steel plants in the United States increased to 271,869 tons (188,047 tons in 1949), those to hydrofluoric-acid plants advanced to 127,401 tons (86,779 tons in 1949), and those to glass and enamel plants rose to 41,534 tons (34,482 tons in 1949).

The average composite selling price ($33.55 a short ton) of all grades of fluorspar (both domestic and foreign) delivered to consumers in the United States in 1950 was $0.36 more than in 1949.

Wage increases of 5 to 10 percent were made by many fluorspar-mining companies in 1950.

The total quantity of fluorspar shipped from mines and imported into the United States from about 1870 through 1950 was approximately 9,607,000 short tons, about 81.5 percent from domestic mines and 18.5 percent from foreign sources.

TABLE 1.—Salient statistics of fluorspar in the United States, 1941–50, in short tons

Year	Shipments from domestic mines	Foreign trade		Consumption	Industry stocks at end of year		
		Imports for consumption	Exports		Domestic mines [1]	Consumers' plants	Total
1941	320,669	7,524	12,184	303,600	31,997	108,900	140,897
1942	360,316	2,151	9,020	360,800	19,429	96,000	115,429
1943	406,016	43,769	9,068	388,885	19,026	105,933	124,959
1944	413,781	87,200	1,980	410,170	19,021	98,446	117,467
1945	323,961	104,925	1,420	356,090	19,863	103,148	123,011
1946	277,940	29,852	1,729	303,190	18,957	98,663	117,620
1947	329,484	78,725	1,180	376,138	33,101	114,150	147,251
1948	331,749	111,626	666	406,269	37,344	146,869	184,213
1949	236,704	95,619	802	345,221	37,039	130,621	[2] 167,660
1950	301,510	164,634	740	426,121	19,038	164,685	[2] 183,723

[1] Finished fluorspar only.
[2] In addition, importers held 11,000 tons in 1949 and 7,500 tons in 1950 (none in 1941–48).

PRODUCTION AND SHIPMENTS

Production of finished fluorspar totaled 283,500 short tons, including 146,631 tons of flotation concentrates; however, the output also included 9,400 tons of finished fluorspar recovered from milling crude ore that had been mined before 1950. Thus, total new production (expressed in terms of finished fluorspar) was 274,100 tons in 1950, compared with 245,600 tons in 1949. Of the mine output in 1950, 6 mines (producing over 10,000 tons each) supplied 96,100 tons, or 35 percent; 11 mines (producing 5,000 to 10,000 tons each) supplied 78,700 tons, or 29 percent; 28 mines (producing 1,000 to 5,000 tons each) supplied 72,700 tons, or 27 percent; and 8 mines (producing 500 to 1,000 tons each) supplied 6,400 tons, or 2 percent. Thus, 53 mines produced 253,900 tons, or 93 percent of the total. Of the remaining output

(20,200 tons, or 7 percent), some (in quantities ranging from a few tons to 500 tons) came from an undetermined number of small mines and prospects, but much was derived from treated tailings from previous milling operations.

In 1950 mines operated by consumers produced 73,700 tons of finished fluorspar, compared with 61,900 tons in 1949.

Fluorspar shipments from domestic mines in 1950 aggregated 301,510 short tons valued at $10,619,717, increases of 27 percent in quantity and 28 percent in value over 1949. Of the 1950 total, 68,933 tons were shipped by river or river-rail for delivery to consumers, compared with 53,243 tons in 1949.

Illinois (51 percent) and Kentucky (27 percent) supplied 78 percent of the fluorspar shipped in 1950, as in 1949. Shipments from Illinois and Kentucky were 27 percent more than in 1949, equal to the percentage gain, as a group, of the other producing States.

The average value of all grades of domestic finished fluorspar shipped in 1950 ($35.22) established a new peak and was 30 cents more than the previous high in 1949.

Fluorspar shipments in 1950 comprised 146,029 tons of fluxing gravel (including 11,240 tons of flotation concentrates, which were blended with fluxing gravel) and foundry lump and 155,481 tons of ground and flotation concentrates. The bulk of the fluxing-gravel and foundry-lump fluorspar was shipped to steel plants and iron foundries, but a comparatively small tonnage moved to plants making cement, ferro-alloys, nickel, basic refractories, and fluxing compounds and to smelters of secondary metals. Of the ground and flotation concentrates shipped in 1950, hydrofluoric-acid plants took 63 percent and glass and enamel plants 25 percent; the remainder went chiefly to aluminum- and magnesium-reduction works; to manufacturers of steel, ferro-alloys, and welding rods; and to smelters of secondary metals.

TABLE 2.—Fluorspar shipped from mines in the United States, 1949–50, by States

State	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Colorado	22,324	$763,296	$34.19	18,489	$654,089	$35.38
Illinois	120,881	4,621,733	38.23	154,623	6,110,765	39.52
Kentucky	63,438	2,018,209	31.81	80,137	2,554,668	31.88
New Mexico	12,844	446,086	34.73	20,036	742,408	37.05
Utah	8,332	180,166	21.62	18,936	337,912	17.84
Other States:						
Arizona	846	237,264	26.70	952	219,875	23.67
Montana	422			41		
Nevada	5,847			7,577		
Texas	1,770			719		
Total	236,704	8,266,754	34.92	301,510	10,619,717	35.22

TABLE 3.—Fluorspar shipped [1] from mines in the United States, by States, 1946–50, with shipments of maximum year and cumulative shipments from earliest record to end of 1950, in short tons [2]

State	Maximum shipments		Shipments by years						Total shipments [1] from earliest record to end of 1950	
							1950			
	Year	Short tons	1946	1947	1948	1949	Short tons	Percent of total	Short tons	Percent of total
Arizona	1939	1,608	389	1,601	1,271	846	952	0.3	17,094	0.2
California	1934	181							341	(3)
Colorado [4]	1944	65,209	32,539	32,153	27,698	22,324	18,489	6.1	574,617	7.4
Illinois [4]	1943	198,789	154,525	167,157	172,561	120,881	154,623	51.3	4,144,178	52.9
Kentucky [4]	1941	142,862	63,143	90,256	84,889	63,438	80,137	26.6	2,594,477	33.1
Montana	1949	422			318	422	41	(3)	781	(3)
Nevada	1948	9,615	6,234	8,042	9,615	5,847	7,577	2.5	100,526	1.3
New Hampshire	1917	1,274							8,302	.1
New Mexico	1944	42,973	17,584	27,526	24,968	12,844	20,036	6.7	321,033	4.1
Tennessee	1906	360							1,197	(3)
Texas	1944	4,769	1,118	1,019	906	1,770	719	.2	14,779	.2
Utah	1950	18,936	2,370	1,730	9,523	8,332	18,936	6.3	52,259	.7
Washington	1945	132	38						382	(3)
Wyoming	1944	19							19	(3)
Total	1944	413,781	277,940	329,484	331,749	236,704	301,510	100.0	7,829,985	100.0

[1] Figures for 1880–1905 represent production.
[2] Quantity and value figures, by States, for 1880–1925 in Mineral Resources, 1925, pt. 2, pp. 13–14, and for 1910–40 in Minerals Yearbook, Review of 1940, p. 1297.
[3] Less than 0.05 percent.
[4] Figures on production not recorded for Colorado before 1905, for Illinois before 1880, and for Kentucky before 1886 and for 1888–95. Total unrecorded production (estimated) included in "Total shipments" column as follows: Colorado, 4,400 tons; Illinois, 20,000 tons; and Kentucky, 600 tons.

TABLE 4.—Fluorspar shipped from mines in the United States, by grades and industries, 1949–50, in short tons

Grade and industry	1949	1950
Fluxing gravel and foundry lump:		
Ferrous	[1] 115,242	[1] 141,375
Nonferrous	789	826
Cement	572	525
Miscellaneous	4,560	3,295
Exported		8
Total	[1] 121,163	[1] 146,029
Ground and flotation concentrates:		
Ferrous [2]	[1] 9,494	[1] 15,144
Nonferrous	1,248	1,464
Glass and enamel	32,352	38,282
Hydrofluoric acid	70,759	97,659
Cement		81
Miscellaneous	904	2,131
Exported	783	720
Total	[1] 115,540	[1] 155,481
Acid lump: Nonferrous	1	
All grades:		
Ferrous	124,736	156,519
Nonferrous	2,038	2,290
Cement	572	606
Glass and enamel	32,352	38,282
Hydrofluoric acid	70,759	97,659
Miscellaneous	5,464	5,426
Exported	783	728
Grand total	236,704	301,510

[1] Fluxing gravel includes (and flotation concentrates exclude) the following quantities of flotation concentrates blended with fluxing gravel: 1949, 6,948 tons; 1950, 11,240 tons.
[2] Includes pelletized gravel.

SHIPMENTS, BY USES

As is evident from table 5 and figure 1, the predominant purchaser of fluorspar is the steel industry, which also consumes substantial quantities of hydrofluoric acid and sodium fluoride, for which fluorspar is the basic material.

TABLE 5.—Fluorspar shipped from mines in the United States, 1949–50, by uses

Use	1949				1950			
	Quantity		Value		Quantity		Value	
	Percent of total	Short tons	Total	Average	Percent of total	Short tons	Total	Average
Steel	50.4	119,264	$3,555,743	$29.81	49.6	149,410	$4,384,271	$29.34
Iron foundry	1.3	3,103	103,061	33.21	1.3	3,945	134,929	34.20
Glass	11.7	27,727	1,043,512	37.64	10.1	30,450	1,176,994	38.65
Enamel	2.0	4,625	186,312	40.28	2.6	7,832	327,081	41.76
Hydrofluoric acid	29.9	70,759	2,991,166	42.27	32.4	97,659	4,164,901	42.65
Miscellaneous	4.4	10,443	354,439	33.94	3.8	11,486	401,795	34.98
Exported	.3	783	32,521	41.53	.2	728	29,746	40.86
Total	100.0	236,704	8,266,754	34.92	100.0	301,510	10,619,717	35.22

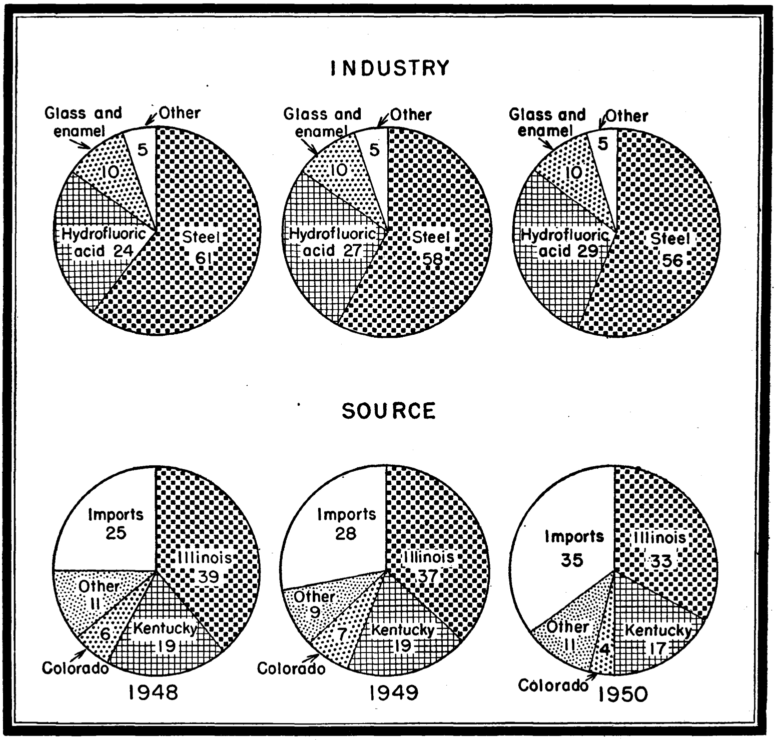

FIGURE 1.—Fluorspar sales (domestic and foreign) to consumers in the United States, 1948–50, by consuming industries and sources, in percent.

STOCKS AT MINES

According to the reports of producers, the quantity of fluorspar in stock at mines or shipping points at the close of 1950 totaled 75,090 tons, or 38 percent less than in 1949. These stocks comprised 19,038 tons of finished fluorspar and 56,052 tons of crude fluorspar (calculated to be equivalent to 27,000 tons of finished fluorspar).

TABLE 6.—Stocks of fluorspar at mines or shipping points in the United States, by States, at end of year, 1948–50, in short tons [1]

State	1948		1949		1950	
	Crude [2]	Finished	Crude [2]	Finished	Crude [2]	Finished
Colorado	6,498	757	7,995	851	6,837	869
Illinois	36,090	12,509	39,684	9,903	29,954	5,822
Kentucky	13,928	23,423	15,212	25,469	5,789	10,076
Nevada		292		217		100
New Mexico	6,046	312	21,186	440	13,472	392
Texas	180	2	400	70		
Utah		49		89		1,779
Total	62,742	37,344	84,477	37,039	56,052	19,038

[1] Stocks reported for California and Idaho for 1948 have been dropped from the record.
[2] This crude (run-of-mine) fluorspar must be beneficiated before it can be marketed.

CONSUMPTION AND CONSUMERS' STOCKS

Tables 7 and 8 give data on consumption and consumers' stocks of fluorspar.

TABLE 7.—Fluorspar (domestic and foreign) consumed and in stock in the United States, by industries, 1949–50, in short tons

Industry	1949			1950		
	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31
Basic open-hearth steel	183,045	100,591	3,948	212,928	131,924	4,307
Electric-furnace steel	18,278			27,567		
Bessemer steel	178			307		
Iron foundry	4,956	1,745	63	5,956	1,709	118
Ferro-alloys	2,860	808		3,753	753	39
Hydrofluoric acid [1]	89,152	17,138	149	124,440	19,417	223
Primary aluminum [2] / Primary magnesium	950	813		1,167	820	50
Glass	30,797	5,553	879	33,440	5,134	908
Enamel	5,510	1,277	65	7,723	1,468	281
Cement	848	875		485	1,060	25
Miscellaneous	8,647	1,821	72	8,355	2,400	94
Total	345,221	130,621	5,176	426,121	164,685	6,045

[1] Fluorspar used in making artificial cryolite and aluminum fluoride (aluminum raw materials) is included in the figures for hydrofluoric acid, which is an intermediate in their manufacture.
[2] Figures on consumption represent fluorspar used as a flux; see footnote 1.

TABLE 8.—Production of basic open-hearth steel and consumption and stocks of fluorspar (domestic and foreign) at basic open-hearth steel plants, 1946–50

	1946	1947	1948	1949	1950
Production of basic open-hearth steel ingots and castings ... long tons	54,034,000	68,506,000	70,830,000	62,634,000	76,873,000
Consumption of fluorspar in basic open-hearth steel production ... short tons	145,631	189,773	207,342	183,045	212,928
Consumption of fluorspar per long ton of basic open-hearth steel made ... pounds	5.4	5.5	5.9	5.8	5.5
Stocks of fluorspar at basic open-hearth steel plants at end of year ... short tons	61,600	68,400	106,300	97,400	128,300

Fluorspar was reported consumed in 41 States and the District of Columbia in 1950, but 3 States—Illinois, Ohio, and Pennsylvania—used 214,398 tons, or 50 percent of the total consumption. Pennsylvania was again the chief consuming State; it ranked first in consumption of fluorspar in both steel and glass. Illinois maintained its rank as the largest consumer of fluorspar in hydrofluoric acid in 1950.

Table 9 shows, so far as possible without revealing the figures of individual companies, the consumption of fluorspar by States in 1949 and 1950.

TABLE 9.—Fluorspar (domestic and foreign) consumed in the United States, by States, 1949–50, in short tons

State	1949	1950	State	1949	1950
Alabama, Georgia	10,517	12,882	Kentucky	5,319	15,238
Arkansas, Louisiana, Mississippi, North Carolina, South Carolina	22,457	26,017	Maine, Massachusetts, Rhode Island	1,188	1,530
Florida	------		New Hampshire	------	
California	10,050	10,725	Maryland	6,082	7,437
Colorado, Iowa, Utah	14,578	16,841	Michigan	10,191	13,799
Connecticut	662	887	Minnesota, Wisconsin	3,918	6,441
Delaware, District of Columbia, New Jersey	24,380	33,112	Missouri	2,790	3,809
Illinois	54,452	69,011	New York	12,808	15,648
Indiana	24,250	30,465	Ohio	56,451	67,182
Kansas, Nebraska, South Dakota, Wyoming	265	80	Oklahoma	1,048	1,110
			Oregon, Washington	1,965	1,387
			Pennsylvania	72,066	78,205
			Tennessee	389	715
			Texas	5,295	9,576
			Virginia	78	87
			West Virginia	4,022	3,937
			Total	345,221	426,121

REVIEW BY STATES

Arizona.—Production of fluorspar in Arizona was 952 short tons in 1950, compared with 846 tons in 1949. The 1950 output came chiefly from the Lone Star mine in Cochise County. The shaft at the Lone Star mine was extended about 40 feet to the 200-foot level, and a heavier hoist and a second air compressor were installed. Some fluorspar was also produced by mines in Maricopa County, by the Apache mine in Cochise County, and by the Arizona Fluorspar Development Co. from a property in Pima County. Except for the Apache mine output, which went to the flotation mill at Deming, N. Mex., the fluorspar produced in Arizona was shipped to steel plants.

California.—The Industrial Minerals & Chemical Co., West Berkeley, Calif., ground some Nevada fluorspar, which it sold chiefly to local dealers. The company also ground some Nevada fluorspar on a toll basis for Balfour, Guthrie & Co., Ltd., and L. H. Butcher Co., which sold it to glass and enamel plants.

Colorado.—Production of finished fluorspar in Colorado decreased for the sixth consecutive year; it was 18,500 short tons in 1950 compared with 22,400 tons in 1949. However, the 1950 production included 548 tons of finished fluorspar recovered from milling crude ore mined before 1950. Consequently, new production (expressed in terms of finished fluorspar) totaled 17,952 tons in 1950 compared with 23,000 tons in 1949. Output came from Boulder, Chaffee, Jackson, Jefferson, and Mineral Counties.

Shipments of fluorspar from Colorado in 1950 likewise declined for the sixth consecutive year and were the smallest since 1941; they were 18,489 tons, compared with 22,324 tons in 1949.

The Ozark-Mahoning Co., operating a flotation mill near Jamestown, produced 20 percent more flotation concentrates in 1950 than in 1949. The flotation-mill feed comprised ore from the Afterthought, Argo, Blue Jay, and Emmett mines, in Boulder County.

The flotation mill of the General Chemical Division, Allied Chemical & Dye Corp., near Jamestown, produced 13 percent less concentrates than in 1949. The flotation-mill feed came from the company-owned Burlington mine in Boulder County.

The Wagon Wheel Gap mine of the Colorado Fuel & Iron Corp. in Mineral County produced only about one-third as much fluxing-gravel fluorspar as in 1949. The mine was closed in the third quarter of 1950; it had been operated by the company since July 15, 1924.

No mining was done by Fluorspar, Inc., in 1950, but the company continued building its new flotation mill near Salida, Chaffee County.

At the property of the Colorado Fluorspar Corp., in Jackson County, development was carried on, and a substantial tonnage of fluorspar was added to reserves. Extensive deposits were opened in the northwest section of the property. No mining was done by the company, but 307 tons of jig tailings were shipped from the property to a cement plant.

During 1950 Alcoa Mining Co. acquired the Kramer claims, which adjoin on the north the property of the Colorado Fluorspar Corp.

Illinois.—Illinois maintained its premier position as a fluorspar-producing State. Production of finished fluorspar was 150,500 short tons in 1950; about 91 percent came from Hardin County and the remainder from Pope County. However, the 1950 production includes 3,800 tons of finished fluorspar recovered from milling crude ore mined before 1950. Consequently, new production (expressed in terms of finished fluorspar) totaled 146,700 tons in 1950 compared with 119,700 tons in 1949. Some Kentucky fluorspar is milled in Illinois, and some Illinois fluorspar is milled in Kentucky; the finished fluorspar so recovered, as well as that shipped, is credited in the statistics to the State of origin. The Argo, Blue Diggings, Crystal, Deardorff, Douglas, East Green, Empire, Fairview, Geely Shaft, Interstate, Jefferson, Mahoning Shafts Nos. 2, 4, and 5, Minerva, North Boundary, Pell, Pell Shaft, Recovery Shaft, Redd, Rosiclare, and Victory properties supplied about 96 percent of the fluorspar produced in Illinois in 1950. Most of the remainder came from many mines and prospects, chiefly the Austin, Baker, Blue Valley, Grand Pier, Hamp, Hillside, Humm, Lead Hill, Mahoning Shaft No. 3, North Green, Tems, and Twitchell.

Shipments of fluorspar from Illinois (154,623 tons) were 28 percent more than in 1949 and contributed 51 percent of the total domestic shipped. Of the 1950 total, 31,699 tons were shipped by river or river-rail to consumers, compared with 29,742 tons in 1949.

The Alcoa Mining Co. produced 69 percent more flotation concentrates in 1950 than in 1949. The mill feed comprised ore from the company-operated Argo, Blue Diggings, and Fairview mines. The ore from these mines is first treated in the company heavy-medium unit, which supplies an enriched product for flotation feed. The Argo-Blue Diggings vein system was worked through the Fairview shaft on the 300-, 400-, 500-, 600-, 700-, and 800-foot levels. A 30-foot winze was sunk from the 900-foot level as a drainage sump. Five holes between the Argo and Daisy faults on the Fairview tract were drilled to determine the geological conditions to decide whether grouting would decrease water coming into the Blue Diggings workings. The Joiner and Pankey tracts in Hardin County were drilled, but no fluorspar was found.

Despite the fact that its Crystal mine was flooded during the first 6½ months of 1950, the Crystal Fluorspar Co., Inc., produced 36 percent more finished fluorspar than in 1949. Excessive rains during the first half of 1950 caused the "Big Sink," a landlocked area covering 800 acres, to rise to a level several feet higher than during the 1937 flood of the Ohio River; consequently, water seeping into the mine through innumerable underground crevices and fissures caused it to flood. The Crystal Fluorspar Co. also operated the Jefferson mine, where a 180-foot shaft was being sunk to connect with a winze to permit mining at the 380-foot level.

The Ozark-Mahoning Co. produced 27 percent more fluorspar flotation concentrates in 1950 than in 1949. The mill feed comprised ore from the Deardorff, East Green, Mahoning Shafts Nos. 2, 3, 4, and 5, and North Green mines near Cave in Rock, Ill., the Delhi-Babb mine near Salem, Ky., and the Commodore mine near Marion, Ky., and some purchased ore, chiefly from the Alcoa Mining Co., Crystal Fluorspar Co., Inland Steel Co., and Rosiclare Lead & Fluorspar Mining Co. Production of finished fluorspar in 1950 comprised 74.9 percent acid grade, 23 percent pelletized gravel, and 2.1 percent filter cake; the filter cake was sold to a local producer for blending with fluxing gravel. Production and shipments of finished fluorspar from the Delhi-Babb and Commodore mines have been credited to Kentucky in the statistics. The Ozark-Mahoning Co. was the largest producer of fluorspar in the United States in 1950.

The Rosiclare Lead & Fluorspar Mining Co. operated the Eureka, Geely, Interstate, North Boundary, Pell, Recovery, and Rosiclare properties in 1950, but the North Boundary was the chief producing mine of the company. The company also purchased finished fluorspar and milling ore from local producers. The ore from company mines is mill feed for its heavy-medium, jig, and flotation mills. Production of finished fluorspar of all grades was 14 percent less than in 1950, but shipments were 5 percent larger.

Operations at the mine and flotation mill of Minerva Oil Co. were at increased rates in 1950. Despite a 19-day strike in June, production of flotation concentrates was 41 percent greater than in 1949. An air shaft was completed at the mine in anticipation of introducing diesel loading and hauling equipment in the "east stope" area to replace electric slushers and cable-reel trucks currently in use in mining the flat-bedded deposit. New steel bins were erected at the hoisting shaft.

Production in 1950 at the Douglas mine in Pope County, operated by the P. M. T. Mining Co. and Hicks Creek Fluorspar Mining Co., was 48 percent more than in 1949. The Redd mine operated by Redd Mining Co., Grand Pier mine operated by Grand Pier Mining Corp., and the Empire mine operated by Egyptian Mining Co.—all also in Pope County—and the Baker mine operated by Golconda Illinois Mining Co., Inc., Humm mine operated by C. C. Mackey, and Pell mine operated by Thurmond Coal Co.—all in Hardin County—were the largest of the many smaller mines worked in Illinois in 1950.

Inland Steel Co., which discontinued fluorspar mining in Illinois in 1948, sold the mineral rights of five tracts in Hardin County and the flotation mill, gravity mill, powerhouse, and head frame at Rosiclare to the Kentucky Fluor Spar Co., Marion, Ky., in 1950. The Kentucky Fluor Spar Co. operated the flotation mill and Hillside mine during the latter part of the year.

Federal and State funds were granted and preliminary surveys were made for constructing a $500,000 flood wall at Rosiclare, primarily for protection of the fluorspar properties.

Kentucky.—Production of finished fluorspar in Kentucky declined for the third consecutive year; it was 64,700 short tons in 1950 compared with 65,500 tons in 1949. However, the 1950 production includes 1,100 tons of finished fluorspar recovered from milling crude ore mined before 1950. Consequently, new production (expressed in terms of finished fluorspar) totaled 63,600 tons in 1950 compared with 64,800 tons in 1949. Shipments, however, were 80,137 tons compared with 63,438 tons in 1949. Of the 1950 shipments, 37,234 tons were shipped by river or river-rail to consumers, compared with 23,501 tons in 1949.

Production of fluorspar in Caldwell County was 900 short tons in 1950 compared with 400 tons in 1949. The 1949 output came chiefly from the Williamson mine.

The major part of the 1950 output in Crittenden County came from the Blue, Commodore, Delhi-Babb, Pigmy, Tabb No. 1, and Yandell No. 22 mines. Some of the remainder came from many smaller producing mines, including the Mary Belle, Watkins, Krausse, and Ainsworth; but most was recovered from tailings from previous milling operations.

Production and shipments of fluorspar in 1950 by the United States Steel Co. (formerly United States Coal & Coke Co.) were 16 and 25 percent, respectively, greater than in 1949. Output came from the Tabb No. 1 and Yandell No. 22 mines.

The Kentucky Fluor Spar Co. and affiliates shipped 21 percent more fluorspar and "fluorbarite" than in 1949. The company operates a mill at Marion and, through its mining division (Roberts & Frazer and Frazer & Hettiger) operates the Carr and Wright mines in Livingston County, Ky., and the Hillside mine in Hardin County, Ill. Only two-fifths of the output came from company mines in 1950; most of it was supplied by the Blue Valley, Empire, Mary Belle, May, Krausse, Pell, and Redd mines, the flotation mills of Minerva Oil Co. and Butler & Moodie, and by mines in Mexico. The Mexican fluorspar, which was used to raise the grade of locally purchased fluorspar, has not been included in the statistics for Kentucky.

The Inland Steel Co. suspended operations at its Keystone mine near Marion in 1950; this mine had been an important producer for many years However, its heavy-medium mill operated throughout 1950 treating stockpiled crude ore. Production at the heavy-medium mill was 5 percent less than in 1949. Shipments of fluorspar by Inland Steel Co. were nearly double those in 1949.

Output of fluxing-gravel fluorspar at the Pigmy mine of the Pigmy Corp. (subsidiary of the Rosiclare Lead & Fluorspar Mining Co.) declined for the sixth consecutive year and was 63 percent less in 1950 than in 1949. However, an appreciable tonnage of flotation concentrates was recovered from Pigmy pond fines at the flotation mill of Crider Bros. Fluorspar Co. for the Pigmy Corp. in 1950. Heavy rains caused a shut-down of operations at the Railroad shaft and interrupted work at the new 250-foot Hoptown shaft, which is down 170 feet.

All of the supply of Delhi Fluorspar Corp. in 1950 was purchased from local producers and from Mexico; the Mexican fluorspar was blended with domestic fluorspar. The Mexican fluorspar so blended and shipped has not been included in the statistics for Kentucky. Total sales were slightly less in 1950 than in 1949.

L. Conyer shipped 2.7 times more fluorspar in 1950 than in 1949. He operates a jig mill near Marion and depends on purchases of local ore and tailings for his supply. Most of it was obtained from the Baker, Pell, and Twitchell mines in Illinois and the Bonanza and Davenport mines in Kentucky.

Ben E. Clement, who also depends on purchased fluorspar from local mines, sold 7 percent less fluorspar than in 1949.

Crider Bros. Fluorspar Co. worked the Blue mine near Mexico, Ky., reclaimed some fluorspar from the Blue and Haffaw dumps, mined a small tonnage at the Marble mine in Caldwell County, and purchased fluorspar from local producers. The ore from the company mines is mill feed for its gravity-concentrating and flotation mills. Output in 1950 comprised 61 percent metallurgical-grade fluorspar and 39 percent flotation concentrates. In addition, the company produced flotation concentrates on a custom basis for Pigmy Corp., Inland Steel Co., and C & L Fluorspar Co. Sales of fluorspar by the company were 37 percent greater than in 1949.

C & L Fluorspar Co. did no mining in 1950 but depended on purchases of fluorspar from local mines and Mexico for its supply. Some flotation concentrates were produced for the company by Crider Bros. Fluorspar Co. Total sales by C & L Fluorspar Co. were 10 percent less than in 1949.

Davenport Mines, Inc., did not operate its Davenport and Hicks mines in 1950. However, its heavy-medium mill was operated on accumulated dump piles and produced a small tonnage of concentrates.

The Alcoa Mining Co. did not operate any fluorspar mines in Kentucky in 1950, but its Mary Belle mine was leased to and operated by F. B. Moodie, Jr. However, the company located some additional fluorspar by drilling at its Klondike mine, and auger drilling on the Eagle-Watson tract disclosed an area of gravel fluorspar in the overburden.

In Livingston County production of finished fluorspar increased to 10,400 tons in 1950 from 7,500 tons in 1949. The output in 1950 came chiefly from the Carr, May, Bonanza, Wright, and Mineral Ridge mines and from reworking the Klondike tailings.

Output at the Carr and Wright mines of Roberts & Frazer was 45 percent greater than in 1949.

Butler & Moodie continued to reclaim fluorspar from Klondike tailings at its flotation mill near Mullikin.

No fluorspar was mined in the Central Kentucky fluorspar district in 1950.

Montana.—Production of fluorspar in Montana was only 41 short tons in 1950 compared with 422 tons in 1949. The 1950 output came from the Coeur d'Alene Extension Mines, Inc., of the Riverside Copper Mining Co., in Mineral County near Superior. The company also did 250 feet of drifting in 1950.

Nevada.—Shipments of fluorspar from Nevada were 7,577 short tons in 1950 compared with 5,847 tons in 1949.

The chief producing mine in Nevada in 1950 was the Daisy, in Nye County, operated by J. Irving Crowell, Jr.; its production was 55 percent more than in 1949. The Baxter mine in Mineral County, operated by V. S. Baxter, was the second-largest producing mine in 1950; its output, however, declined 39 percent from 1949 and was the smallest since 1935. The Cirac Revenue Group in Churchill County, operated by C. P. Cirac, produced 45 percent more fluorspar than in 1949. The H. W. Gould & Co. bought the Baxter mine and plans to build a heavy-medium mill and a flotation mill to treat the ore.

New Mexico.—Production of finished fluorspar in New Mexico was 20,000 short tons in 1950, a gain of 54 percent over 1949. However, the production includes 3,700 tons of finished fluorspar recovered from milling crude ore mined before 1950. Consequently, production (expressed in terms of finished fluorspar) totaled 16,300 tons in 1950 compared with 20,800 tons in 1949. The 1950 output came from Grant, Luna, Sierra, and Valencia Counties. The Zuñi mines in Valencia County, Shrine mine in Grant County, and Greenleaf and White Eagle mines in Luna County supplied about 84 percent of the fluorspar produced in New Mexico in 1950. Most of the remainder came from many mines and prospects, chiefly the Clum, Greenspar, Linda Vista, Little Whitewater, Nakaye, Sadler No. 2, and Valley.

Shipments from New Mexico totaled 20,036 tons in 1950, a gain of 56 percent over 1949.

The flotation mill of General Chemical Division, Allied Chemical & Dye Corp., at Deming, produced 40 percent more concentrates in 1950 than in 1949. The mill feed comprised ore from the company-operated Shrine mine in Grant County and purchased ore from local mines, chiefly the White Eagle and Greenleaf in Luna County and the Little Whitewater, Greenspar, and Clum in Grant County.

The flotation mill of Zuñi Milling Co., at Los Lunas, produced 2.6 times more fluorspar in 1950 than in 1949. The mill feed comprised ore chiefly from the company mines near Grants in Valencia County, but some was purchased from local mines—principally the White Eagle and Nakaye—and from Mexico. The concentrate recovered from Mexican ore, as well as that shipped, has not been included in the statistics on production and shipments.

H. E. McCray operated the Greenleaf and Greenleaf No. 2 mines in Luna County near Deming and purchased fluorspar from the Valley and Sadler No. 2 properties.

Tennessee.—Charles H. Young, Director, Division of Chemical Engineering, Tennessee Valley Authority, states: [1]

Calcium fluoride produced by the Tennessee Valley Authority is a byproduct of a fluorine-recovery system under development at TVA's experimental fused tricalcium phosphate fertilizer plant near Columbia, Tenn. Since a market for the byproduct calcium fluoride has not been established, production of the material has not been recorded. The material produced was of varying composition and was discarded.

Texas.—Production of finished fluorspar in Texas was 649 tons in 1950 compared with 1,838 tons in 1949. However, the 1950 production included 146 tons recovered from milling crude ore mined before 1950. Consequently, new production (expressed in terms of finished fluorspar) was only 503 tons in 1950 compared with 1,916 tons in 1949. Shipments were 719 tons in 1950 compared with 1,770 tons in 1949. Output was from the Eagle Mountains mine in Hudspeth County, near Van Horn, operated by the Texas Fluorspar Mines, Inc. Production was discontinued in the second quarter of 1950.

Utah.—Production of fluorspar in Utah in 1950 established a new record; it was 20,626 short tons, a gain of 146 percent over 1949 and 117 percent greater than in 1948, the previous record year. The bulk of the production came from Juab County, near Delta, where Bell Hill Mining Co., Chesley & Black, T. A. Claridge, George Spor & Sons, Ward Leasing Co., and Willden Bros. operated. Heretofore, the fluorspar produced in the Delta area has been shipped to the steel plant at Geneva, Utah, but the 1950 output was marketed widely.

A report [2] on the J. B. fluorspar deposit in Beaver County has been issued.

MILLING

Output of flotation concentrates from domestic ore totaled 146,631 short tons in 1950, compared with 111,247 tons in 1949. In addition, 396 tons of flotation concentrates were recovered from milling 685 tons of Mexican ore at a plant in the United States in 1950.

Six flotation cells were added to the fluorspar circuit at the flotation mill near Cave in Rock, Ill., of Minerva Oil Co., to assist in converting a larger proportion of the production to ceramic grades.

The Ozark-Mahoning Co., which operates flotation plants at Rosiclare, Ill., and Jamestown, Colo., completed and began operating its drying plant at Wilmington, Del., in June 1950. Acid-grade filter cake from the flotation mill serving the Osor mine in Spain is dried at this plant, and the dried concentrates are shipped to Eastern consumers.

An improved process for the concentration of fluorspar ores by froth flotation has been developed.[3]

The separation of quartz and fluorspar has been described.[4]

---

[1] Letter to Bureau of Mines, January 12, 1951.

[2] Everett, F. D., and Wilson, S. R., Investigation of the J. B. Fluorite Deposit, Beaver County, Utah: Rept. of Investigations 4726, 1950, 11 pp.

[3] Clemmer, J. B., and Clemmons, B. H. (assigned to the United States of America), Method of Concentrating Fluorspar Ores: U. S. Patent 2,497,863, Feb. 21, 1950.

[4] Lambeth, A. J., Separation of Quartz and Fluorspar: Chem. Eng. and Min. Rev., vol. 42, No. 11, Aug. 10, 1950 pp. 433–435.

PRICES

Metallurgical-grade fluorspar containing 70 percent or more effective calcium fluoride content was quoted at $37 a short ton f. o. b. Illinois-Kentucky mines on January 1, 1950, but advances of $2 a ton were made on September 14 and October 26. Corresponding increases were also made in the prices of other grades of metallurgical fluorspar. Imported metallurgical-grade fluorspar was quoted throughout 1950 at $38 to $40 a short ton at Atlantic Seaboard, duty paid. Acid-grade fluorspar containing a minimum of 97 percent calcium fluoride was advanced $3 a ton on October 12 to $46.50 a short ton f. o. b. Illinois mines.

The average selling price of all grades of domestic fluorspar shipped in 1950 was $35.22 a short ton—a new peak—compared with $34.92 in 1949.

FOREIGN TRADE[5]

Imports.—Imports of fluorspar into the United States established a new record of 164,634 short tons in 1950, a gain of 72 percent over 1949 and 47 percent over 1948, the former record year. The 1950 total comprised 43,488 tons containing more than 97 percent calcium fluoride and 121,146 tons of lower grade. Imports in 1950 were valued [6] at $2,579,667. The higher-grade fluorspar averaged $24.15 a ton and the lower grade $12.62. The duty on fluorspar containing not more than 97 percent calcium fluoride continued at $5.625 a short ton and on fluorspar containing more than 97 percent calcium fluoride $3.75. However, the reciprocal trade agreement between the United States and Mexico, which had been in effect since December 28, 1942, was abrogated effective December 31, 1950; the duty then reverted to the former rates of $7.50 a short ton for the lower grade and $5 for the higher grade.

The bulk of the fluorspar received in the United States in 1950 was for use by domestic consumers; however, a comparatively small tonnage of acid-grade fluorspar was delivered to the Government stockpile.

In 1950, 8,071 tons of Mexican fluorspar were blended with fluxing-gravel fluorspar from the Illinois-Kentucky district. The Mexican fluorspar so blended has been excluded from the statistics on shipments from mines in the United States and included in the figures on imports.

Table 11, compiled from data supplied to the Bureau of Mines by importers and domestic companies milling foreign fluorspar, shows the quantities of imported fluorspar delivered to consumers in the United States in 1949 and 1950, irrespective of year of importation into the United States. The quantities are based on the actual outturn weights and represent the finished fluorspar recovered from milling and drying foreign ore, rather than the ore milled or concentrate dried.

---

[5] Figures on imports and exports (unless otherwise indicated) compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

[6] Values are at country of origin. The cost to consumers in the United States also includes ocean freight, import duties, etc.

TABLE 10.—Fluorspar imported for consumption in the United States in 1950, by countries and customs districts

[U. S. Department of Commerce]

Country and customs district	Containing more than 97 percent calcium fluoride		Containing not more than 97 percent calcium fluoride		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada:						
Buffalo			2,000	$61,560	2,000	$61,560
Philadelphia	12,163	$364,560			12,163	364,560
Total	12,163	364,560	2,000	61,560	14,163	426,120
Mexico:						
Galveston	177	2,389	256	3,462	433	5,851
Laredo	4,137	55,649	40,532	495,793	44,669	551,442
El Paso	41	616	12,424	107,619	12,465	108,235
San Diego			277	3,923	277	3,923
Arizona	951	14,310	14,072	207,171	15,023	221,481
San Francisco			63	835	63	835
Duluth and Superior			121	1,778	121	1,778
Total	5,306	72,964	67,745	820,581	73,051	893,545
France: Philadelphia	560	7,496	2,212	23,026	2,772	30,522
Germany:						
Philadelphia	8,495	206,505	20,899	317,106	29,394	523,611
Oregon			56	1,286	56	1,286
Washington			174	2,380	174	2,380
Total	8,495	206,505	21,129	320,772	29,624	527,277
Spain:						
Philadelphia	9,381	217,216	25,649	278,162	35,030	495,378
Galveston	272	6,231			272	6,231
Total	9,653	223,447	25,649	278,162	35,302	501,609
Italy:						
Philadelphia	7,311	175,333	2,410	25,227	9,721	200,560
Maryland			1	34	1	34
Total	7,311	175,333	2,411	25,261	9,722	200,594
Total: 1950	43,488	1,050,305	121,146	1,529,362	164,634	2,579,667
1949	20,490	493,134	75,129	1,055,910	95,619	1,549,044

TABLE 11.—Imported fluorspar delivered to consumers in the United States, 1949–50, by uses

Use	1949			1950		
	Short tons	Selling price at tidewater, border, or f. o. b. mill in the United States, including duty		Short tons	Selling price at tidewater, border, or f. o. b. mill in the United States, including duty	
		Total	Average		Total	Average
Steel	68,783	$1,667,252	$24.24	122,459	$3,250,070	$26.54
Hydrofluoric acid	16,020	735,182	45.89	29,742	1,316,595	44.27
Ferro-alloys	278	6,011	21.62	458	10,207	22.29
Glass and enamel	2,130	102,042	47.91	3,252	154,180	47.41
Other	2,648	69,040	26.07	6,626	223,669	33.76
Total	89,859	2,579,527	28.71	162,537	4,954,721	30.48

Exports.—Producers of fluorspar reported exports of 728 short tons of fluorspar valued at $29,746 in 1950, compared with 783 tons valued at $32,521 in 1949. The exports comprised 705 tons of flotation concentrates to Canada, 10 tons to Colombia, and 5 tons to Mexico, and 8 tons of metallurgical-grade fluorspar to Canada. In addition to the fluorspar exported by producers in 1950, dealers exported 11 tons to Peru and 1 ton to Venezuela.

TABLE 12.—Fluorspar reported by producers as exported from the United States, 1945–50

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average			Total	Average
1945	1,420	$45,939	$32.35	1948	644	$24,819	$38.54
1946	1,729	63,797	36.90	1949	783	32,521	41.53
1947	1,180	43,679	37.02	1950	728	29,746	40.86

WORLD REVIEW

Table 13 shows world production of fluorspar, by countries, 1944–50, insofar as statistics are available.

TABLE 13.—World production of fluorspar, by countries, 1944–50, in metric tons

[Compiled by Pauline Roberts]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Argentina (shipments)	2,674	3,012	2,133	2,400	(2)	(2)	(2)
Australia:							
Queensland	520	801	875	887	361	571	(2)
Victoria	266	145	326	332	159	----	(2)
Bolivia (exports)	(2)	19	----	28	227	264	(2)
Brazil	----	----	----	841	751	537	(2)
Canada:							
Newfoundland (shipments)	44,912	25,300	23,366	36,191	47,833	50,417	59,107 (Newfoundland and Other Provinces)
Other Provinces	6,281	6,685	7,296	6,519	10,287	5,795	
France	13,400	14,535	19,235	31,596	32,388	39,954	(2)
French Morocco	----	----	----	----	----	445	40
Germany:							
Federal Republic	[3] 170,000 (Federal Republic and Soviet Zone)	(2) (Federal Republic and Soviet Zone)	[3] 16,910	19,235	37,549	33,871	(2)
Soviet Zone			14,000	21,000	(2)	(2)	(2)
India	1,249	438	----	(2)	(2)	(2)	(2)
Italy	6,757	3,333	7,430	20,860	39,540	17,746	31,611
Japan	7,967	3,207	288	61	68	960	2,425
Korea:							
North	[4] 53,131 (North and South)	19,434 (North and South)	(2)	(2)	(2)	(2)	(2)
South			----	2,600	----	1,230	(2)
Mexico (exports)	56,450	50,251	21,949	45,737	75,381	55,772	65,667
Norway	2,761	3,142	4,590	1,089	1,120	(2)	(2)
Southern Rhodesia	----	----	----	154	12	239	447
Spain	55,595	9,643	8,712	13,885	42,549	59,594	32,669
Sweden	1,836	3,448	3,722	2,780	4,303	(2)	(2)
Switzerland	520	----					
Tunisia	----	----	----	----	560	352	----
Union of South Africa	3,481	3,657	4,821	4,815	3,754	4,857	[3] 7,200
United Kingdom	48,927	44,281	47,200	45,016	71,124	67,575	(2)
United States (shipments)	375,374	293,891	252,142	298,901	300,956	214,733	273,524
Total (estimate)	1,036,000	674,000	524,000	648,000	791,000	673,000	758,000

[1] In addition to countries listed, China and U. S. S. R. produce fluorspar, but data on output are not available; estimates by author of chapter included in total.
[2] Data not available; estimates by author of chapter included in total.
[3] Estimate.
[4] Exports to Japan.

Canada.—According to the Dominion Bureau of Statistics, production of fluorspar in Canada was 59,107 metric tons [7] in 1950, compared with 56,212 tons in 1949.

[7] 1 metric ton is equivalent to 1.10231 short tons.

The St. Lawrence Corp. of Newfoundland, Ltd., and Newfoundland Fluorspar, Ltd., both in Province of Newfoundland, are the chief producers of fluorspar in Canada. There is also comparatively small production in the Province of Ontario.

The St. Lawrence Corp. of Newfoundland, Ltd., has a gravity-concentrating mill and a flotation mill in Newfoundland for treating the ore from its several mines; a subsidiary, St. Lawrence Fluorspar, Inc., has a plant at Wilmington, Del., for drying the flotation concentrate. Shipments by the St. Lawrence Corp. of Newfoundland, Ltd., totaled 18,125 short tons in 1950 (23,891 tons in 1949) and comprised 12,338 tons of acid-grade filter cake and 5,787 tons of fluxing-gravel fluorspar. A shortage of hydroelectric power adversely affected operations in the second quarter of 1950.

Newfoundland Fluorspar, Ltd., has two mines and ships crushed fluorspar principally to Arvida, Quebec, where the Aluminum Co. of Canada, Ltd., has a flotation plant.

In the Province of Ontario, Cardiff Fluorspar Mines was sinking a 7- by 12-foot, two-compartment shaft on its property near Wilberforce.

France.—France has shown much enterprise since World War II in regaining its former position as an important producer of fluorspar. Production was 51,920 and 63,085 metric tons, respectively, in 1938 and 1939, after which it declined progressively to 13,400 tons in 1944. Since 1944, however, output has increased steadily to 39,954 tons in 1949. The chief producing mines are in the Departments of Haute-Loire, Var, and Puy-de-Dôme, where output was 10,766 tons, 9,548 tons, and 8,267 tons, respectively, in 1949. The remaining production came chiefly from the Departments of Aveyron, Saône-et-Loire, and Tarn. A review of the fluorspar industry in France from 1938 to 1949 has been given by Chermette.[8]

Korea.—The Kaekok fluorspar mine near Tanyang has been described.[9] In 1944 the mine was purchased by the Chosen Refining Co., which operated it until sometime in 1945, when it was closed. The mine was reopened in April 1949, since when it has yielded about 1,000 metric tons of hand-sorted fluorspar, which was added to a prewar stockpile of 500 tons.

Mexico.—Chiefly as a result of record demand in the United States—the principal market for Mexican fluorspar—production (as measured by exports) in Mexico was 65,667 metric tons in 1950, an increase of 18 percent over 1949 but 13 percent less than the record high established in 1948. About 2,200 tons of Mexican fluorspar are used in local metallurgical plants, and some is exported to Canada. It was reported[10] that newly found deposits of fluorspar have been opened in the Municipality of Muzquiz.

Spain.—The 3-year upward trend in production of fluorspar in Spain was halted in 1950, when there was a 45-percent decline from the record output of 59,594 metric tons in 1949. Consumption of fluorspar in Spain is small; consequently, the industry is largely dependent on the export market for its survival. The United States

[8] Chermette, M. A., L'Exploitation du Spath-Fluor en France de 1938 à 1946. (Exploitation of Fluorspar in France During 1938 to 1946): L'Echo des Mines et de la Métallurgie, No. 3.427, December 1950, pp. 547–549.

[9] Hyde, Pitt W., A Report on the Kaekok Lead and Fluorite Mines: Economic Cooperation Administration Mission to Korea, Rept. 574, Apr. 24, 1950, 4 pp.

[10] Robertson, F. S., American Consulate Rept. 6, Piedras Negras (Mexico), Apr. 4, 1949.

was an important market in 1950; imports of Spanish fluorspar into the United States were 32,025 metric tons compared with 11,474 tons in 1949. Much of the fluorspar received in the United States from Spain in 1950 was acid-grade filter cake from the flotation mill serving the Osor mine in the Gerona district; the filter cake is dried at Wilmington, Del.

Sweden.[11]—Boliden Mining Co. has taken over mines producing fluorspar in the Osterlen district of southern Sweden. Output is in excess of the company's needs. Annual production of fluorspar is about 3,000 tons.

United Kingdom.—Fluorspar is found in economic quantities in various parts of Great Britain. Present production comes from old lead mines reopened for fluorspar, from veins in the lead-mining areas containing mainly fluorspar, and from dumps from old lead workings.[12] The bulk of the acid-grade fluorspar at present comes from Derbyshire—75 percent from the Glebe mine and the remainder from hand-picking pure lump spar. It is reported that new sources of supply will soon be available in Weardale, where two flotation plants are now under construction. About 85 percent of the metallurgical fluorspar comes from Derbyshire and the remainder from Durham.

The Glebe mine, at Eyam, Derbyshire, is served by a heavy-medium plant and a flotation mill.[13] The two largest producers of fluorspar in Weardale, Durham, are Weardale Lead Co., which works a number of veins, and Fluorspar, Ltd., which operates the Stanhope Burn mine.

The discovery of rich veins of fluorspar in the Allendale district, Northumberland County, has been reported.[14] Samples from the Whitewood and Barneycraig veins analyzed 99.33 and 98.61 percent calcium fluoride.

CRYOLITE

Cryolite occurs in commercial quantity and is mined at only one place—Ivigtut, Greenland.

Synthetic cryolite was manufactured in the United States in 1950 by the Aluminum Ore Co. at East St. Louis, Ill. and the Reynolds Metals Co. at Bauxite (Hurricane Creek), Ark.

Imports of natural and artificial cryolite into the United States were 15,298 long tons valued at $978,175 in 1950, compared with 18,309 tons valued at $1,312,260 in 1949. The imports in 1950 comprised 15,200 tons from Greenland and 98 tons from Belgium.

Exports of cryolite from the United States were 1,850 long tons valued at $404,931 in 1950, compared with 324 tons valued at $77,709 in 1949 and 650 tons (revised figure) valued at $143,430 (revised figure) in 1948. Of the 1950 exports, 1,555 tons went to Canada, 121 tons to Mexico, 87 tons to Trieste, 59 tons to Austria, and the remainder to Brazil, India, Union of South Africa, Uruguay, and Venezuela.

The preparation and use of natural cryolite have been described.[15]

[11] Engineering and Mining Journal, vol. 151, No. 5, May 1950, p. 148.
[12] South African Mining and Engineering Journal, vol. 60, pt. 2, No. 2971, Jan. 21, 1950, pp. 703, 705.
[13] Mining World (London), vol. 12, No. 6, Apr. 15, 1950, p. 71.
[14] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 1, July 1950, p. 34.
[15] Mudd, Henry T., Fluorspar and Cryolite: Industrial Minerals and Rocks, Am. Inst. Min. and Met. Eng., New York, 1949, pp. 398–401, 403.

Fuel Briquets and Packaged Fuel[1]

By J. A. Corgan and Golden V. Chiriaco

GENERAL SUMMARY

PRODUCTION of fuel briquets and packaged fuel in 1950 totaled 2,770,020 and 135,682 net tons, respectively, increases of 15 and 8 percent over 1949. Briquets were shipped to 37 States and the District of Columbia in 1950. Exports, all destined for Canada, totaled 175,768 tons, and imports, all from Canada, totaled 804 tons.

Bituminous coal and Pennsylvania anthracite were the principal raw fuels used in the manufacture of fuel briquets and packaged fuel in 1950. Asphaltic binders were used almost exclusively in making briquets, and both asphalt and starch, together with a small amount of cement, were employed as binders in manufacturing packaged fuel.

FUEL BRIQUETS

Pertinent data on the fuel-briquetting industry from 1946 to 1950 are summarized in table 1. Production, by regions, from 1917 to 1950 is illustrated in figure 1.

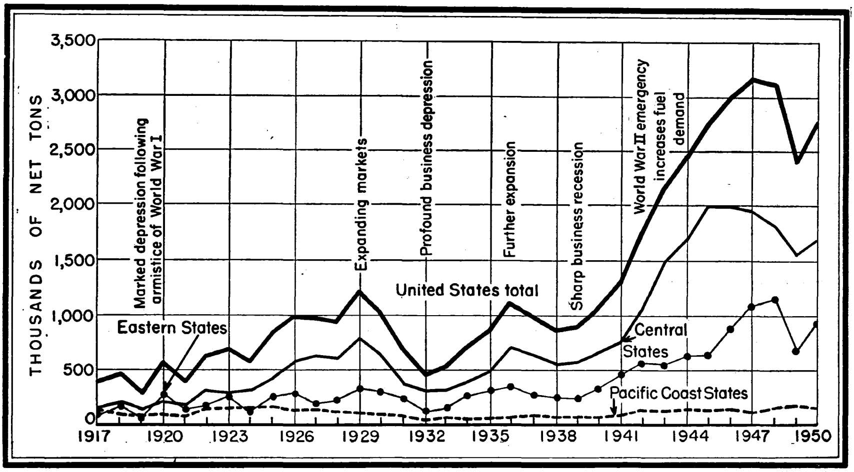

FIGURE 1.—Production of fuel briquets in the United States, by regions, 1917–50.

DOMESTIC PRODUCTION

The 15-percent increase in the output of fuel briquets in 1950, when a total of 2,770,020 net tons was produced, can be attributed largely to the somewhat colder weather prevailing in 1950 as compared to 1949, when 2,403,971 tons was produced.

[1] Briquets made from charcoal, wood scrap, and fruit pits are not included in Bureau of Mines review

TABLE 1.—Salient statistics of the fuel-briquetting industry in the United States, 1935–39 (average), and 1946–50

	1935–39 (average)	1946	1947 [1]	1948	1949	1950
Production:						
Eastern States...net tons..	285,248	880,109	1,089,705	1,151,041	674,938	934,635
Central States.......do....	588,573	1,986,234	1,966,834	1,820,074	1,557,819	1,691,914
Pacific Coast States.do....	75,196	137,684	115,057	157,362	171,214	143,471
Total..............do....	949,017	3,004,027	3,171,596	3,128,477	2,403,971	2,770,020
Imports.................do....	11,792	653	387	329	365	804
Exports.................do....	[2] 18,206	163,339	248,760	207,885	167,140	175,768
Consumption, apparent [3] net tons..	942,603	2,841,341	2,923,223	2,920,921	2,237,196	2,595,056
Plants in operation...........	32	35	35	36	33	31
Value of production...........	$6,083,308	$25,299,612	$30,762,253	$36,011,322	$28,641,424	$32,039,379
Average value per net ton f. o. b. plant:						
Eastern States.............	$4.28	$6.61	$7.82	$9.55	$9.65	$9.50
Central States.............	$7.08	$9.03	$10.56	$12.58	$12.59	$12.46
Pacific Coast States........	$9.23	$11.26	$12.77	$13.51	$14.67	$14.49
World production..metric tons.	62,000,000	[4] 60,000,000	[4] 60,000,000	[4] 70,000,000	[4] 70,000,000	70,000,000

[1] Peak year of United States fuel-briquet production.
[2] 1937–39 average. Not reported separately before 1937.
[3] Production plus imports minus exports.
[4] Revised figure.

As shown in table 2, 31 plants produced briquets in 1950.[2] Fourteen States contributed to the 1950 production, the Central States with 22 plants accounting for 61 percent of the total output. Wisconsin, with 10 plants and 43 percent of the national output, was the largest individual producing State. West Virginia followed with 2 plants, and Pennsylvania ranked third with 4 plants operating. Other producing States, in order of output, were Missouri, Oregon, Illinois, North Dakota, Michigan, Washington, Indiana, Kansas, Arkansas, California, and Nebraska. The total value of the 1950 production was $32,039,379, an increase of about 12 percent over the value reported in 1949 ($28,641,424).

TABLE 2.—Production of fuel briquets in the United States, 1949–50

	1949			1950				
							Percent of change from 1949 in —	
	Plants	Net tons	Value	Plants	Net tons	Value	Tonnage	Value
Eastern States.......	8	674,938	$6,512,664	6	934,635	$8,880,434	+38	+36
Central States.......	22	1,557,819	19,616,565	22	1,691,914	21,080,670	+9	+7
Pacific Coast States.	3	171,214	2,512,195	3	143,471	2,078,275	−16	−17
Total..........	33	2,403,971	28,641,424	31	2,770,020	32,039,379	+15	+12

Capacity.—Reversing a downward trend which had started in 1948, the rate of production in 1950 (62 percent of capacity) showed a substantial increase. (See table 3.) Nine plants, each with an annual capacity of 200,000 tons or more, furnished 2,007,577 tons or about 73

[2] Directories of fuel-briquet and packaged-fuel operations and a list of manufacturers of briquetting machinery, M. M. S. Nos. 1964, 1965, and 1959, respectively, are obtainable on request from the Bureau of Mines, Washington 25, D. C.

percent of the total production, utilizing 65 percent of their combined capacity. Sixteen plants with an annual capacity of 100,000 tons or more each accounted for 90 percent of the total production.

TABLE 3.—Annual capacity and production of briquetting plants in the United States, 1946–50

	Number of active plants	Annual capacity (net tons)	Production	
			Net tons	Percent of annual capacity
1946	35	4,533,300	3,004,027	66.3
1947	35	4,615,160	3,171,596	68.7
1948	36	4,670,510	3,128,477	67.0
1949	33	4,616,360	2,403,971	52.1
1950:				
Capacity of—				
Less than 25,000 tons	3	32,000	14,662	45.8
25,000 to less than 100,000	12	552,000	267,111	48.4
100,000 to less than 200,000	7	761,000	480,670	63.2
200,000 to less than 400,000	6	1,610,000	1,074,387	66.7
400,000 or more	3	1,500,000	933,190	62.2
Total	31	4,455,000	2,770,020	62.2
Production of—				
Less than 5,000 tons	3	132,000	25,383	19.2
5,000 to less than 10,000	2			
10,000 to less than 25,000	5	211,000	88,248	41.8
25,000 to less than 100,000	13	1,202,000	720,426	59.9
100,000 or more	8	2,910,000	1,935,963	66.5
Total	31	4,455,000	2,770,020	62.2

Raw Fuels.—Bituminous coal was the principal raw fuel used in the manufacture of fuel briquets in 1950, followed in order by Pennsylvania anthracite and petroleum coke. These accounted for almost 89 percent of the raw fuels used. Residual carbon from the manufacture of oil gas, Arkansas hard coals, lignite char, and residual carbon from pyrolysis of natural gas also were used as raw fuels. Yard screenings used at 12 plants were the source of 19 percent of all raw fuels.

TABLE 4.—Raw fuels used in making fuel briquets in the United States, 1950

Type of raw fuel used	Plants using	Net tons used	Source of raw fuel used	Plants using	Net tons used		
					Yard screenings	Other raw fuels	Total
Pennsylvania anthracite	14	638,356	Yard screenings exclusively (from own or other yards)	2	79,552		79,552
Arkansas hard coals	8	111,757	Raw fuels (other than yard screenings) exclusively	19		1,439,267	1,439,267
Bituminous low-volatile coal	16	1,427,046	Both yard screenings and other raw fuels	10	414,778	665,782	1,080,560
Bituminous high-volatile coal	3	95,030					
Semicoke (lignite char)	1	183,808					
Residual carbon from pyrolysis of natural gas	1						
Residual carbon from manufacture of oil gas	2						
Petroleum coke	4	143,382					
Total	[1] 31	2,599,379	Total	31	494,330	2,105,049	2,599,379

[1] A number of plants used more than 1 kind of raw fuel; hence, the sum of the plants is greater than the actual number of plants active (31) in 1950.

Pennsylvania anthracite was used extensively, either alone or in combination with bituminous coal, in Pennsylvania and Wisconsin. Large quantities of bituminous coal were used widely in the Eastern and Central States. Residual carbon from oil gas and natural gas was the principal raw material used in the Pacific Coast States.

Binders.—Asphaltic binders are employed almost exclusively in making briquets in the United States. In 1950, 29 operators used approximately 170,641 tons of asphaltic binders and very small quantities of coal-tar pitch; 2 operators used no binder. The percentage of binder in the briquets (by weight) ranged generally from 5 to 9 percent. In a few instances, the percentage was higher. Twenty-three plants, accounting for about 91 percent of the 1950 production, used binders representing from 5 to 8 percent of the weight of the briquets.

TABLE 5.—Classification of briquetting plants in the United States, by type of binder used, 1947–50

	1947		1948		1949		1950	
	Plants	Percent of total briquet production	Plants	Percent of total briquet production	Plants	Percent of total briquet production	Plants	Percent of total briquet production
Type of binder used:								
No binder [1]	2	95.8	2	95.9	2	100.0	2	100.0
Asphalt	30		31		30		28	
Asphalt and coal-tar pitch	1	4.2	1	4.1	1		1	
Asphalt and starch	1							
Oil-gas tar pitch	1		1					
Rosin and wax			1					
Total	35	100.0	36	100.0	33	100.0	31	100.0

[1] Residual carbons from manufacture of oil gas and bituminous coal were raw fuels used at plants employing no binder.

SHIPMENTS

Weight and Shape.—In 1950 briquets ranged in weight from 1⅞ to 20 ounces. Pillow shapes, all under 5 ounces except for an 11-ounce bituminous high-volatile pillow, were made at 28 plants and represented 78 percent of the total production; 2½-ounce cylindrical (barrel-shaped) and 18- and 20-ounce cubes supplied 22 percent of the total production.

In addition to the 2,563,711 tons of fuel briquets shipped to 37 States and the District of Columbia in 1950, 175,768 tons was exported to Canada. Wisconsin, Minnesota, Missouri, and Michigan received 1,470,895 tons of the total briquets shipped. The difference between production in 1950 (2,770,020 net tons) and shipments within the United States (2,563,711 tons), or 206,309 tons, represents exports, briquets used at plants for power or heat, and changes in producers' stocks. Briquets are used almost entirely for space heating, but in 1950 operators reported 11,737 tons used for power or heat at their plants.

Of total shipments of fuel briquets in 1950, 79 percent moved by rail and 21 percent by truck. In the Eastern States about 97 percent was shipped by rail and 3 percent by truck; in the Central States about 71 percent moved by rail and 29 percent by truck; and in the Pacific Coast States about 48 percent moved by rail and 52 percent by truck.

TABLE 6.—Shipments of fuel briquets of domestic manufacture in the United States, by States of destination, as reported by producers, 1949–50, in net tons [1]

State of destination	1949	1950	State of destination	1949	1950
Arkansas	2,727	1,941	New Hampshire	2,515	3,292
California	15,770	20,796	New Jersey	21,255	13,242
Connecticut	2,834	2,623	New York	20,302	23,076
Delaware	368	319	North Carolina	17,257	29,691
District of Columbia	1,169	2,509	North Dakota	104,741	126,927
Florida	53	379	Ohio	56,982	89,086
Georgia		51	Oregon	76,755	69,190
Idaho	255	149	Pennsylvania	38,689	39,279
Illinois	128,729	167,509	Rhode Island	1,702	1,964
Indiana	68,999	120,003	South Carolina	2,779	6,821
Iowa	86,567	89,500	South Dakota	96,045	101,273
Kansas	22,330	15,615	Tennessee	821	3,459
Kentucky	4,264	8,413	Texas	66	
Maine	5,258	6,345	Vermont	1,686	2,401
Maryland	14,955	22,117	Virginia	25,071	36,310
Massachusetts	11,018	19,306	Washington	26,696	30,477
Michigan	225,461	278,841	West Virginia	1,714	2,495
Minnesota	341,057	378,996	Wisconsin	437,173	521,112
Missouri	272,228	291,946			
Montana	34	35	Total	2,182,671	2,563,711
Nebraska	46,346	36,223			

[1] For shipments outside the United States see export statistics, table 8.

TABLE 7.—Direct shipments of fuel briquets by rail and truck, as reported by producers, 1949–50, in net tons [1]

Produced in—	1949			1950		
	Rail	Truck	Total	Rail	Truck	Total
Eastern States	650,902	24,447	675,349	901,653	28,160	929,813
Central States	1,111,686	442,442	1,554,128	1,196,665	489,149	1,685,814
Pacific Coast States	68,190	78,023	[2] 146,213	67,205	73,719	[2] 140,924
Total United States	1,830,778	544,912	[3] 2,375,690	2,165,523	591,028	[3] 2,756,551

[1] Includes shipments outside the United States.
[2] Includes small tonnage shipped by scow.
[3] An additional 3,923 tons was used by 3 producers as fuel at their plants in 1949 and 11,737 tons by 4 producers in 1950.

PRICES

After an increase each year during the period 1946–49, the average value per ton of briquets (f. o. b. plant) produced in the Eastern, Central, and Pacific Coast States dropped slightly in 1950. (See table 1.) Proceeds per ton (f. o. b. plant) vary greatly because of the different local conditions under which briquets are made. In the Eastern States briquets are made relatively near the coal fields, hence, the cost of raw material does not involve large freight charges; therefore, the f. o. b. plant price is relatively low. In the Central States briquets generally are made at plants great distances from the original coal source; consequently, raw fuel costs at these plants include a considerable freight charge which is reflected in higher prices per ton f. o. b. plant. The highest plant values are shown in the Pacific Coast States, where the raw fuels used are residual carbons from the manufacture of oil gas and pyrolysis of natural gas.

These f. o. b. plant values vary considerably from the prices paid for briquets by consumers, as retail prices include transportation costs and retail dealers' margins. Retail prices of fuel briquets for selected cities may be obtained from the Bureau of Labor Statistics, United States Department of Labor, Washington 25, D. C.

FOREIGN TRADE [3]

Imports of fuel briquets into the United States reached a peak of 123,593 net tons in 1926, when a strike during the winter of 1925–26 in the Pennsylvania anthracite fields created a shortage of fuels in this country. Imports have been negligible since 1941, amounting to only a few hundred tons a year; in 1950, 804 tons, all of which came from Canada, was imported.

In 1950 exports of fuel briquets, all to Canada, totaled 175,768 tons, an increase of 5 percent over 1949. The value of 1950 exports was $2,617,007, an increase of 7 percent over 1949.

TABLE 8.—Briquets (coal and coke) exported from the United States, 1948–50, by countries of destination and customs districts

[U. S. Department of Commerce]

	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
COUNTRY						
Canada	207,142	$2,644,598	166,961	$2,436,004	175,768	$2,617,007
Newfoundland-Labrador	671	8,440	179	2,280		
Denmark	20	374				
Ireland	4	90				
Mexico	48	480				
Total	207,885	2,653,982	167,140	2,438,284	175,768	2,617,007
CUSTOMS DISTRICT						
Arizona	48	480				
Buffalo	104,715	1,388,557	84,750	1,285,958	97,550	1,545,754
Dakota	37,862	478,505	35,871	481,934	28,249	357,911
Duluth and Superior	22,322	294,613	16,733	224,708	21,834	272,951
Maine and New Hampshire	261	3,130	1,077	19,361	498	8,124
Michigan	13,095	125,932	4,629	61,222	1,839	17,783
Montana and Idaho					1,779	22,726
New York	20	374				
Ohio	4,319	40,839				
Philadelphia	675	8,530	740	9,397	448	5,951
Rochester	7,569	86,783	4,123	28,907	800	11,098
St. Lawrence	8,542	138,793	12,555	243,713	12,268	269,258
Vermont	430	4,799	64	512	11	120
Washington	8,027	87,647	6,598	82,572	10,492	105,331
Total	207,885	2,653,982	167,140	2,438,284	175,768	2,617,007

TECHNOLOGY

The Anthracite Institute and the Pennsylvania State College continued their research, which has been under way for several years, on the recovery, upgrading, and utilization of fine sizes of anthracite. A number of reports on briquetting or pelletization of anthracite fines by extrusion have been released by these organizations.

Cooperative work by the Bureau of Mines and the Natural Resources Research Institute, of the University of Wyoming, was continued on the briquetting of subbituminous coals. The fuels for briquetting were prepared at the Bureau of Mines laboratories and briquetted at the pilot plant at the university. Description of this work is contained in a publication released by the university in 1949.[4]

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

[4] Boley, Charles C., and Rice, Neal, Briquetting of Dried Low-Rank Western Coals: Univ. Wyoming Natural Resources Inst., Bull. 3, November 1949, 76 pp.

A pilot plant for drying and briquetting coal was designed by the Bureau and erected at the university by the institute. A fluidized drying process developed by the Bureau will preheat and dry the subbituminous coal fed to the briquetting press.

WORLD PRODUCTION

Data on the production of fuel briquets are not available for all countries; however, as indicated in table 9, Germany is one of the world's largest producers of fuel briquets.

TABLE 9.—World production of fuel briquets, by countries, 1946–50, in metric tons [1]

[Compiled by Pauline Roberts]

Country [1]	1946	1947	1948	1949	1950
Algeria	97,518	82,888	77,820	56,616	(2)
Australia: Victoria [3]	522,157	420,340	(2)	(2)	(2)
Belgium	1,079,620	1,348,480	970,180	780,860	1,014,290
Canada	299,100	290,707	323,133	459,908	(2)
Czechoslovakia:					
Bituminous coal	209,180	259,130	(2)	(2)	(2)
Lignite	252,452	283,645	291,326	[4] 297,000	[4] 303,300
France	5,162,450	5,118,830	5,948,000	6,365,000	6,307,000
French Morocco	22,202	46,215	22,959	[4] 15,000	34,573
Germany:					
Federal Republic:					
Bituminous coal [5]	1,902,000	2,176,000	2,972,000	3,586,000	3,720,000
Lignite [5]	10,774,000	11,840,000	12,898,000	14,250,000	14,910,000
Soviet zone: Lignite [4]	28,600,000	26,000,000	30,000,000	30,000,000	30,000,000
Hungary:					
Bituminous coal	20,210	70,970	(2)	(2)	(2)
Lignite	33,670				
India	19,761	----------	----------	----------	----------
Indochina	4,710	(2)	12,000	(2)	(2)
Indonesia	(2)	[4] 2,000	9,420	25,323	25,278
Ireland	85,781	53,311	23,626	16,257	(2)
Japan [6]	54,000	108,600	220,000	615,704	915,460
Korea, South	[7] 105,000	200,994	76,724	168,358	(2)
Netherlands:					
Bituminous coal	725,859	910,046	935,865	992,000	1,049,000
Lignite	43,655	41,673	62,988	61,000	56,000
New Zealand	13,183	11,592	13,113	13,935	(2)
Pakistan	(8)	(2)	4,670	8,972	[4] 5,500
Poland:					
Bituminous coal	529,082	631,915	717,508	796,000	[9] 631,300
Lignite	27,190	41,697	113,633	175,000	[9] 170,200
Portugal	77,276	97,418	73,821	(2)	[4] 78,300
Spain	833,445	789,535	1,005,285	1,135,859	1,092,000
Sweden	25,565	86,900	133,400	54,500	(2)
Tunisia	32,347	36,764	45,746	43,153	(2)
Turkey	12,572	15,130	7,426	40,102	(2)
United Kingdom	1,571,829	1,870,548	1,489,529	1,536,268	[4] 1,406,000
United States:					
Briquets	2,725,193	2,877,208	2,838,092	2,180,834	2,512,907
Packaged fuel	173,198	165,906	142,439	114,258	123,088
Total (estimate)	60,000,000	60,000,000	70,000,000	70,000,000	70,000,000

[1] In addition to countries listed, briquets are produced in Bulgaria, Italy, Mexico, Rumania, U. S. S. R., and Yugoslavia, but production figures are not available. Estimate included in total.
[2] Data not available; estimate included in total.
[3] Fiscal year ended March 31 of year following that stated.
[4] Estimate.
[5] British and American zones only.
[6] Briquets used by government railway only. In addition, an unknown amount is manufactured for household use; accurate data are not available.
[7] August to December, inclusive.
[8] Included with India.
[9] Incomplete.

PACKAGED FUEL

Salient statistics of the packaged-fuel industry in the United States from 1946 to 1950 are summarized in table 10.

TABLE 10.—Salient statistics of the packaged-fuel industry in the United States, 1935–39 (average), 1940, and 1946–50

	1935–39 (average)	1940 (peak year of production)	1946	1947	1948	1949	1950
Production:							
Eastern States net tons	5,052	6,349	9,065	2,153	1,859	125,948	135,682
Central States do	116,218	276,994	181,854	180,728	155,154		
Pacific Coast States do	1,563	1,170					
Total do	122,833	284,513	190,919	182,881	157,013	125,948	135,682
Plants in operation	63	106	70	62	62	57	54
Value of production	$1,050,566	$2,391,922	$2,496,388	$2,882,105	$2,735,861	$2,236,748	$2,430,847
Average value per net ton f. o. b. plant:							
Eastern States	$9.45	$9.02	$12.93	$16.58	$17.64	$17.77	$17.19
Central States	$8.50	$8.36	$13.08	$15.75	$17.42	$17.76	$17.92
Pacific Coast States	$9.91	$12.82					

DOMESTIC PRODUCTION

In 1950, 54 plants operated in the United States, as compared with 57 plants in 1949, and produced 135,682 net tons of packaged fuel, valued at $2,430,847, an increase of 8 percent in tonnage and 9 percent in value over the preceding year. Michigan, Wisconsin, and Ohio, in the order named, were the three largest producing States, accounting for about 70 percent of the 1950 output. The average value per net ton (f. o. b. plant) of packaged fuel increased consistently in the Central States from 1946 to 1950. (See table 10.) In the Eastern States, however, after increasing steadily from 1946 to 1949, the average value per ton dropped slightly. Proceeds received by the manufacturers include cost of coal at the mine, freight to factory, direct and indirect manufacturing costs, and profit. For this reason the values may vary greatly from plant to plant, depending on the local conditions under which the product is manufactured. Production of packaged fuel, by States, for 1949–50 is shown in table 11.

TABLE 11.—Production of packaged fuel in the United States, by States, 1949–50

State	1949			1950		
	Plants	Net tons	Value	Plants	Net tons	Value
Indiana	2	(1)	(1)	3	16,355	$297,102
Michigan	19	39,254	$660,874	20	43,786	735,326
Minnesota	4	16,197	332,100	4	19,814	421,553
Ohio	17	28,768	516,792	15	24,150	430,660
Wisconsin	7	23,720	402,560	5	27,082	456,631
Other States	[2] 8	[3] 18,009	[3] 324,422	[4] 7	4,495	89,575
Total	57	125,948	2,236,748	54	135,682	2,430,847

[1] Included in "Other States" to avoid disclosure of individual company operations.
[2] Comprises 2 plants each in Illinois and Virginia, and 1 plant each in Iowa, Kentucky, Missouri, and Nebraska.
[3] Includes Indiana and States listed in footnote 2.
[4] Comprises 2 plants in Virginia and 1 plant each in Illinois, Iowa, Kentucky, Missouri, and Nebraska.

Number of Plants.—Of the 54 plants producing packaged fuel in 1950,[5] 20 plants, located in Michigan, accounted for 32 percent of the total output, 5 plants in Wisconsin accounted for 20 percent of the production, and 15 plants in Ohio accounted for 18 percent.

Capacity of Plants.—Table 12 gives comparative data on capacity and production for 1946 to 1950, inclusive, as reported by packaged-fuel operations active in those years. In 1950, 16 plants with a capacity of 5,000 tons or more, operating at 51 percent of their combined capacity, produced 106,881 tons of packaged fuel, or 79 percent of the total 1950 output. Thirty-eight plants, each with an annual capacity under 5,000 tons, produced 28,801 tons, or 21 percent of the total production, utilizing about 34 percent of their combined capacity.

TABLE 12.—Annual capacity and production of packaged-fuel plants in the United States, 1946–50

	Number of active plants	Annual capacity (net tons)	Production	
			Net tons	Percent of annual capacity
1946	70	530,760	190,919	36.0
1947	62	427,200	182,881	42.8
1948	62	397,620	157,013	39.5
1949	57	331,300	125,948	38.0
1950:				
Capacity of—				
Less than 5,000 tons	38	85,760	28,801	33.6
5,000 to less than 10,000	9	54,800	18,667	34.1
10,000 to less than 15,000	3	30,000	15,890	53.0
15,000 to less than 25,000	2	123,000	72,324	58.8
25,000 or more	2			
Total	54	293,560	135,682	46.2
Production of—				
Less than 1,000	28	56,760	9,958	17.5
1,000 to less than 3,000	17	72,800	28,375	39.0
3,000 to less than 5,000	3	21,000	13,166	62.7
5,000 to less than 10,000	3	35,000	20,612	58.9
10,000 to less than 30,000	3	108,000	63,571	58.9
Total	54	293,560	135,682	46.2

TABLE 13.—Raw fuels used in making packaged fuel in the United States, 1950

Type of raw fuel used	Plants using	Net tons used
Bituminous low-volatile coal	47	118,575
Bituminous high-volatile coal	4	3,891
Pennsylvania anthracite	1	3,186
Semianthracite	3	
Petroleum coke	4	7,230
Total	[1] 54	132,882

Source of raw fuel used	Plants using	Net tons used		
		Yard screenings	Other raw fuels	Total
Yard screenings exclusively (from own or other yards)	31	31,381	--------	31,381
Raw fuels (other than yard screenings) exclusively	11	--------	71,976	71,976
Both yard screenings and other raw fuels	12	8,418	21,107	29,525
Total	54	39,799	93,083	132,882

[1] A number of plants used more than 1 kind of raw fuel; hence, the sum of the plants above is greater than the actual number of plants active (54) in 1950.

[5] See footnote 2.

Raw Fuels.—Five kinds of raw fuel entered into the manufacture of packaged fuel in 1950. Bituminous low-volatile coal used at 47 plants, either alone or in combination with other fuels, comprised 89 percent of the total raw fuel used. Small quantities of bituminous high-volatile coal, Pennsylvania anthracite, semianthracite, and petroleum coke also were used in the manufacture of packaged fuel in 1950.

Yard screenings were used exclusively at 31 plants to produce 23 percent of the total output; raw fuels other than yard screenings were used exclusively at 11 plants to manufacture 55 percent; and screenings and other raw fuels combined were used at 12 plants to produce 22 percent of the total 1950 production.

Binders.—Starch, totaling 702 tons, or an average of about 14 pounds per ton of packaged fuel produced, was the principal binder employed and was used at 49 plants producing about 75 percent of the total 1950 output. Asphalt and cement were used exclusively at a few of the plants. Table 14 gives details on binders employed in manufacturing packaged fuel in 1947–50.

TABLE 14.—Classification of packaged-fuel plants in the United States, by type of binder used, 1947–50

	1947		1948		1949		1950	
	Plants	Percent of total packaged-fuel production	Plants	Percent of total packaged-fuel production	Plants	Percent of total packaged-fuel production	Plants	Percent of total packaged-fuel production
Type of binder used:								
Starch	58	77.9	57	79.8	52	78.3	48	74.6
Asphalt	2	22.1	3	19.5	3	20.6	2	25.4
Starch and asphalt	1		1	.7	1	1.1	1	
Cement	2		2		2		2	
Coal-tar pitch							1	
Total	[1] 62	100.0	[1] 62	100.0	[1] 57	100.0	54	100.0

[1] 1 plant making 2 types of packaged fuel used starch binder for 1 and asphalt and starch for the other; hence, the sum of the items shown exceeds the number of active plants.

SHIPMENTS

Sales of packaged fuel in 1950 totaled 134,550 net tons, of which 112,962 tons (84 percent) was listed as local sales (by truck) and 21,588 tons (16 percent) was reported as other than local sales. Of the 21,588 tons shipped outside the local area, 13,774 tons (about 64 percent) went by truck and 7,814 tons (36 percent) by rail.

TABLE 15.—Shipments of packaged fuel in the United States, by method of transportation, 1946–50, in net tons

Year	Shipped by truck			Shipped by rail	Total
	Local sales [1]	Other than local sales	Total truck		
1946	150,770	25,262	176,032	14,555	190,587
1947	147,599	23,749	171,348	11,270	182,618
1948	128,661	17,753	146,414	10,272	156,686
1949	108,606	11,036	119,642	6,306	125,948
1950	112,962	13,774	126.736	7,814	134,550

[1] Includes sales both called for and delivered.

Gem Stones

By W. F. Foshag,[1] George Switzer,[1] and H. P. Chandler

GENERAL

DOMESTIC PRODUCTION

THE United States continues to be an unimportant factor in world gem production. Although a wide variety of gems is produced in small amount, gem mining probably will continue to be a minor mining industry.

There are no large gem-mining companies in the United States. A few small companies have been organized from time to time to work certain deposits, such as jade, turquoise, sapphire, and tourmaline. Some professional lapidary shops employ a few miners. Most gemstone production results from the efforts of thousands of amateur lapidaries ("rockhounds"), who spend their vacations and week ends searching for materials suitable for cutting and polishing. Chief objects of their search are such varieties of quartz as agate, jasper, and petrified wood. Much of what they collect is sold or exchanged to mineral dealers, local jewelers, or roadside curio shops, particularly in the Southwestern, Western, and Northwestern States. The hobby of lapidary work and gem and mineral collecting has grown phenomenally in the past 15 years. No reliable figures are available as to the number of persons engaged in this hobby, but the best estimates range from at least 200,000 to a million or more.

Since only a small percentage is mined by companies on a commercial scale, no statistics have been compiled as to the value of the domestic output of gem stones. In the rough, it may approximate $400,000 to $500,000.

The many forms of quartz, chiefly the cryptocrystalline varieties, led the field, with kunzite (pink spodumene) second, jade third, and turquoise fourth. Of the producing States, California, Texas, Oregon, Washington, and Wyoming were the leaders.

Agate.—Agate production, including all other varieties of chalcedony, continues to increase as interest grows in the lapidary hobby.

Greatest production in 1950 appears to have been from the Alpine-Big Bend area, Texas, where agates were recovered having a value variously estimated at $10,000 to $50,000.

Another relatively large producing area was Deming, N. Mex., with an estimated production of 30 tons, of which not more than 3 tons was of good quality.

Large quantities of agate were also found in California, Oregon, and Washington, with smaller amounts in Arizona, Montana, and Wyoming. Small quantities of various varieties of chalcedonic quartz, such as petrified wood and jasper, were collected in almost every other State.

---

[1] Smithsonian Institution; consulting mineralogist to Bureau of Mines.

Kunzite.—Kunzite, the pink gem variety of spodumene, figured in the gem-production picture owing to the discovery of a pocket containing 280 pounds of rough kunzite crystals in the San Pedro mine, Pala district, San Diego County, Calif. This is the first discovery of a large quantity of this gem in many years. The value of the find was estimated at $20,000 to $30,000. The largest crystal fragment, containing a large proportion of gem material, weighed 5 pounds. The material is reported to be of good quality but rather pale.

Jade.—The Wyoming jade (nephrite) industry is reported to be decreasing rapidly. The deposits of good green jade are nearly exhausted, with a 1950 production of not over 200 pounds. Prices for good-quality green have increased to as high as $30 per pound. Black jade is still plentiful at $2.00 to $5.00 per pound. Approximately 1,500 pounds of the black variety were sold in 1950, but a market is hard to find. Some black jade has been used as a substitute for black onyx; but, because it is harder to saw and polish, lapidaries prefer the onyx.

In California about 700 pounds of nephrite jade, valued at $700, was produced at Porterville. Smaller amounts were picked up by collectors at other localities, chiefly in Monterey County.

The jadeite jade deposit discovered in San Benito County, Calif., in 1949 has been visited by many collectors but has not been exploited commercially because of its poor color. Other finds of jadeite have been reported in Mendocino County, but so far no good gem material has been reported.

No production of nephrite jade was reported for the year from the Kobuk area, northwestern Alaska.

Turquoise.—Turquoise production in the Southwest continues to diminish. No output was reported from the Cerrillos mine in New Mexico. Some turquoise was mined by the Nevada Turquoise Co. near Battle Mountain, Nev., and the open-pit Castle Dome (copper) mine near Miami, Ariz., produced a small amount of turquoise of good quality.

Other Gem Stones.—No diamonds were produced from the Arkansas diamond mines in 1950, although the newly organized American Diamond Mining Co. indicated the possibility of renewing operations there.

The South Dakota inspector of mines reports 68.5 tons of rose quartz produced in that State in 1950 for ornamental and monumental purposes. Scott's Rose Quartz Co., Custer, S. Dak., mined no gem rose quartz in 1950, but produced 7⅛ tons, valued at $506.50, for ornamental purposes.

A small quantity of rock-crystal quartz from Arkansas and about 500 pounds of asteriated quartz from the Springfield, N. H. area were sold for gem use.

Some quartz colored blue by chrysocolla was produced from various localities in the Southwest, especially at the Inspiration (copper) mine near Miami, Ariz.

No sapphires were produced at the Yogo Sapphire mine, Montana.

An estimated $5,000 worth of colorless to pale-blue topaz was produced in Mason County, Tex., mostly by local collectors for private collections.

A small amount of peridot from near Deming, N. Mex., was sold. This material is reported to be abundant but will only cut 4- to 8-point stones. Peridot in small quantity was also found on the San Carlos Indian Reservation and sold by the Indians in small lots.

Some pyrope garnet was produced near Fort Defiance, Ariz., and sold by the Indians.

CONSUMPTION AND USES

For the first 6 months of the year jewelry sales were slow. The general attitude among retailers was one of depression but not panicky concern, for the early months of every year are traditionally dull in the jewelry stores. Diamonds were particularly slow, principally in higher-valued pieces, because of the anticipated reduction of the jewelry excise tax from 20 percent to 10 percent. The outbreak of the Korean War, however, killed any possibility of a tax reduction and had a strong effect on the sale of diamonds, for there was now nothing to be gained by further postponement of purchases. Actually, consumers saw higher prices in the immediate future because of inflationary influences, higher wages among diamond cutters, and greater demand. These factors, plus an increase in the marriage rate, caused a strong diamond market during the last 6 months of the year.

As usual, the United States again in 1950 was the principal world market for diamonds. There was substantial purchasing of diamonds as investments in several troubled areas of the world and considerable evidence of such type of purchasing of fine-quality diamonds in America during 1950.

The jewelers' Christmas business was good. It gained over 1949 and sufficed to raise the year's volume for the jewelry industry to $1,140,000,000 compared with $1,055,000,000 in 1949, a gain of 8 percent.

Fashions in Jewels.—Fashions in gems showed relatively little basic change during 1950. Jewelry was light, flexible, and mobile. Designed on the theory that diamonds in motion look bigger than diamonds in repose, mountings were made to move loosely.

In mountings, curved lines were the most popular, but with fewer naturalistic flowers and abstract objects. In forms of diamond jewelry, the necklace remained the most important single piece. Earrings changed from the long pendant type to large button clusters on the lobe. Diamond wrist watches became increasingly popular.

The cluster, a large center stone surrounded by one or more rows of stones of matched sizes, was the outstanding motif in 1950, especially in diamonds. The cluster mountings might be marquise, square, oval, or round. Most popular usage of these clusters was in dinner rings.

Toward the end of the year the metal restrictions imposed or on the horizon made new designs uncertain. Gold was being used extensively owing to the shortage of platinum.

More fancy-cut diamonds were used than since the 1920's. Such shapes as pentagon, kite, trapeze, triangle, and half-moon were used extensively. The bulk of the diamond jewelry sold in America, however, is mounted with the standard brilliant, the emerald cut, and occasionally the marquise and baguette.

IMPORTS[2]

Imports of gem stones, exclusive of industrial diamonds, in 1950, as reported by the United States Department of Commerce, totaled $119,641,457, an increase of 42 percent over 1949.

TABLE I.—Precious and semiprecious stones (exclusive of industrial diamonds) imported for consumption in the United States, 1949–50

[U. S. Department of Commerce]

Commodity	1949		1950	
	Carats	Value	Carats	Value
Diamonds:				
Rough or uncut (suitable for cutting into gem stones), duty-free	[1] 633, 731	[1] $28,246,634	819, 083	$44, 775, 769
Cut but unset, suitable for jewelry, dutiable	335, 487	41, 427, 718	492, 671	58, 524, 902
Emeralds:				
Rough or uncut, duty-free	80, 231	226, 233	12, 142	7, 991
Cut but not set, dutiable	13, 723	284, 578	9, 706	237, 446
Pearls and parts, not strung or set, dutiable:				
Natural		532, 310		410, 970
Cultured or cultivated		1, 733, 698		3, 192, 334
Other precious and semiprecious stones:				
Rough or uncut, duty-free		208, 124		324, 089
Cut but not set, dutiable		2, 045, 476		2, 429, 992
Imitation, except opaque, dutiable:				
Not cut or faceted		36, 090		19, 088
Cut or faceted:				
Synthetic		680, 428		811, 372
Other		8, 495, 151		8, 752, 863
Imitation, opaque, including imitation pearls, dutiable		37, 819		14, 854
Marcasites, dutiable:				
Real		170, 405		136, 768
Imitation		7, 802		3, 019
Total		[1] 84, 132, 466		119, 641, 457

[1] Revised figure.

TECHNOLOGY

Additional experiments in the artificial coloration of diamonds in a cyclotron were carried out during the year.[3] Color changes noted were usually from pale brown to green, white to bluish green, and yellow to yellow green. Occasional changes from yellow to golden brown were observed. The induced color appears to be permanent but is only present as a surface skin. No permanent induced radioactivity was observed. Diamonds subjected to neutron bombardment in an atomic pile were said to have been quickly blackened after first passing through an intermediate green color.

Research on diamonds was carried out by the Diamond Research Laboratory of Johannesburg, Union of South Africa, sponsored and supported by the Industial Distributors (1946), Ltd.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.
[3] Gems and Gemology, Summer 1950, p. 295, and Spring 1951, p. 3.

DIAMONDS

The year 1950 was a record-breaking one in the diamond industry. Sales of diamonds effected through the Central Selling Organization on behalf of South African and other producers set a new record, as follows: Gem diamonds £38,357,698, industrial diamonds £12,609,343, total £50,967,041. The previous record was a total of £38,000,000 established in 1948. Whereas the quantity of diamonds sold in 1950 was approximately the same as the quantity sold in 1948, the proceeds realized in sterling in 1950 exceeded by nearly £13,000,000 (34 percent) the sterling proceeds in 1948. This increase was due to devaluation of the pound sterling in terms of the dollar in September 1949.

A new record was also set for world production of diamonds in 1950, with a total of 15,300,000 carats, compared with 14,175,000 carats in 1949.

Cutting.—The strong demand for gem diamonds in 1950 tended to alleviate somewhat the unemployment situation in the cutting centers. Both the Diamond Manufacturers Association and the World Federation of Diamond Workers passed resolutions at their annual conventions in Amsterdam urging uniform working conditions and hours throughout the industry.

Belgium continues to be the largest cutting center, followed by Germany, Netherlands, Israel, and the United States. Smaller cutting centers are well-established in South Africa, England, and Puerto Rico. Efforts to revive the Cuban diamond-cutting industry failed. In the United States there are about 300 diamond-cutting establishments, employing approximately 1,500 workers. High cutting costs in the United States, compared to other cutting centers, foreign currency manipulation, and other difficulties were only partly offset by greater efficiency and finer categories of cutting in the American industry.

Imports.—Imports of gem-grade diamonds into the United States amounted to $103,300,671 in 1950 compared to $69,674,352 in 1949, an increase of 48 percent. Percentagewise, rough or uncut stones showed the greatest increase in total value. Belgium furnished 50 percent (value) of the cut in 1950.

TABLE 2.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
1949						
Argentina				3	$1,009	$336.33
Belgian Congo	3,100	$6,096	$1.97			
Belgium-Luxembourg				159,189	19,581,847	123.01
Brazil	[1] 12,315	[1] 411,799	[1] 33.44	4,679	615,265	131.49
British Guiana	241	6,464	26.82	30	3,011	100.37
Canada				38	5,303	139.55
Chile				13	3,990	306.92
China				4	700	175.00
Cuba				580	71,099	122.58

[1] Revised figure.

TABLE 2.—Diamonds (exclusive of industrial diamonds) imported for consumption in the United States, 1949–50, by countries—Continued

[U. S. Department of Commerce]

Country	Rough or uncut			Cut but unset		
	Carats	Value		Carats	Value	
		Total	Average		Total	Average
1949—Continued						
Czechoslovakia				44	$4,357	$99.02
Denmark				139	11,300	81.29
France				2,843	355,899	125.18
French Morocco				63	15,091	239.54
Germany				3,528	283,903	80.47
Gold Coast	6,947	$81,936	$11.79			
Hong Kong				75	41,172	548.96
Iran				996	82,039	82.37
Israel				70,485	5,402,074	76.64
Italy				27	134,933	4,997.52
Lebanon				103	13,829	134.26
Liberia	60	2,500	41.67			
Netherlands				24,789	3,202,227	129.18
Netherlands Antilles	11	3,534	321.27	15	3,689	245.93
Switzerland				14,465	1,932,944	133.63
Thailand				1,142	251,155	219.93
Union of South Africa	[1] 580,376	[1] 26,911,452	[1] 46.37	39,644	8,404,959	212.01
U. S. S. R.				8,663	539,412	62.27
United Kingdom	1,708	118,838	69.58	3,771	449,356	119.16
Venezuela	[1] 28,973	[1] 704,015	[1] 24.30	159	17,155	107.89
Total 1949	[1] 633,731	[1] 28,246,634	[1] 44.57	335,487	41,427,718	123.49
1950						
Argentina				109	11,847	108.69
Australia				12	6,500	541.67
Belgian Congo	400	11,059	27.65			
Belgium-Luxembourg	1,631	85,283	52.29	257,942	29,115,318	112.88
Brazil	43,043	955,922	22.21	2,125	190,562	89.68
British Guiana	821	25,078	30.55	1	148	148.00
British West Africa, n. e. s.	15,274	349,455	22.88			
Canada	1,415	6,413	4.53	657	98,343	149.68
China				90	12,738	141.53
Cuba				261	34,893	133.69
Denmark				104	7,118	68.44
France				4,497	517,574	115.09
French Equatorial Africa	215	14,009	65.16			
French Morocco				156	14,779	94.74
Germany	3	41	13.67	7,317	603,797	82.52
Hong Kong				321	64,126	199.77
Hungary				5	120	24.00
India				8	1,277	159.63
Iran				16	1,551	96.94
Israel	98	5,938	60.59	86,192	6,834,363	79.29
Italy				5	900	180.00
Kuwait				2	542	271.00
Lebanon				217	37,770	174.06
Netherlands	480	13,932	29.03	44,978	4,845,140	107.72
Philippines				30	8,500	283.33
Portuguese Asia				39	11,329	290.49
Southern-Southeastern Asia, n. e. s.				75	4,621	61.61
Switzerland				3,251	740,125	227.66
Thailand				418	81,596	195.21
Union of South Africa	703,520	41,956,932	59.64	74,476	14,313,316	192.19
U. S. S. R.				3,919	190,000	48.48
United Kingdom	9,349	380,338	40.68	5,448	776,009	142.44
Venezuela	42,834	971,369	22.68			
Total 1950	819,083	44,775,769	54.67	492,671	58,524,902	118.79

[1] Revised figure.

World Production.—Official figures on diamond production are not available for all countries, but the figures in the accompanying table are believed to be reasonably accurate, as they have been compiled from Government reports, information supplied by officials of producing companies, and other authoritative sources. World production (gems and industrials) is estimated to have been 15,300,000 metric carats, which compares with 14,175,000 (revised figure) carats for 1949, an increase of 8 percent.

Belgian Congo is the leading producer by weight, but only about 5 percent of the Belgian Congo production is of gem quality. South Africa, although producing much less by weight, leads in value owing to the high percentage of gem stones.

TABLE 3.—World production of diamonds, 1947–50, by countries, in metric carats

[Including Industrial Diamonds]

Country	1947	1948	1949	1950
Africa:				
Angola	799,210	795,509	769,981	538 867
Belgian Congo	5,474,469	5,824,567	9,649,896	10,147,471
French Equatorial Africa	107,076	[1] 118,300	[1] 122,928	111,460
French West Africa	53,749	77,970	94,996	126,346
Gold Coast	[2] 852,493	[3] 850,000	[1 2] 972,976	[3] 950,000
Sierra Leone	605,554	465,518	494,119	655,474
South-West Africa	179,554	200,691	280,134	488,422
Tanganyika	92,229	148,169	191,787	195,274
Union of South Africa:				
Lode	918,042	[3] 930,000	964,266	1,516,194
Alluvial	[4] 286,692	[3 4] 270,000	[4] 289,756	[4] 231,674
Total Union of South Africa	1,204,734	[3] 1,200,000	1,254,022	1,747,868
Brazil [3]	275,000	250,000	250,000	200,000
British Guiana	24,669	36,562	34,790	37,462
Venezuela	61,634	75,513	56,362	60,389
Other countries [3]	3,500	3,500	3,000	3,000
Grand total (round figures)	9,750,000	10,050,000	[1] 14,175,000	15,300,000

[1] Revised figure.
[2] Exports.
[3] Estimated.
[4] Includes an estimated 100,000 carats for State mines of Namaqualand.

Industrial Diamonds.—Details regarding imports, production, sales, and uses of industrial diamonds will be found in the Abrasive Materials chapter of this volume.

OTHER GEM STONES

The price of most gem stones other than diamonds continued to increase owing to short supply of newly mined stones of fine quality.

Again in 1950 Canada produced very little in the way of gem stones. A few tons each of sodalite, peristerite, and labradorite are produced each year, but the total value probably does not exceed a few hundred dollars.

Ceylon maintained its output of important quantities of a variety of gems, chiefly ruby, sapphire, chrysoberyl (including alexandrite), topaz, spinel, garnet, zircon, and tourmaline. The Ceylon gems come from the alluvial gravels of the Ratnapura district. The gem-mining industry is chiefly handled by villagers and minor concerns. Value of the annual production is believed to be about $500,000.

Emeralds were mined at the Chivor-Somondoco mines in Colombia. Production for 1949 was reported to be 91,656 carats. According to latest reports, the famous Muzo, Colombia, mines are still closed. Some good-quality emeralds were mined at Kaliguman, India, a small village in the Udaipur district, State of Rajasthan. South Africa and Brazil continued to produce a few emeralds.

Australian gem-sapphire production for 1948 had a reported value of £A 6,000.[4] In September 1948 a 1,958-carat (uncut weight) blue sapphire was discovered at Anakie, central Queensland.

Gem-stone production of Burma for 1949 was as follows: Ruby 100 carats, sapphire 2,500 carats, spinel 12,500 carats, jadeite 2,393 pounds, total value approximately $88,500.[5]

The Australian opal-mining industry continues at a low ebb. South Australia is now the largest producer, with the main fields lying in the Stuart Range north of Tarcoola. Only about 100 miners are now active, and the value of the annual production averages about $200,000.[6]

Madagascar gem-stone production for the first half of 1950, chiefly tourmaline, beryl, and garnet, was 9,004 grams.[7]

In Mozambique the pegmatites in the Alto Ligonho district produced some fine-quality rubellite, morganite, and aquamarine, some of which came into the United States.

The zircon mining and cutting industry of Thailand, which experienced a sudden boom immediately after World War II, is now in a depressed condition. Bangkok cutters predict that, if the present export volume is not increased soon, it may be impossible to keep the industry alive. The zircons are mined in the Provinces of Chantaburi and Ubonrajathani, in southeast Thailand along the Thai-Indochina border.

Brazil continued to produce a large caratage of amethyst, aquamarine, citrine, topaz, and tourmaline and smaller amounts of euclase, chrysoberyl, andalusite, and other stones.

SYNTHETIC GEM STONES

Corundum and Spinel.—The year 1950 witnessed further recapture of the American market by European producers of synthetic corundum and spinel. Chief production is in Germany, followed by France. India and Japan are other foreign producers.

The Idar-Oberstein district, in the French zone of West Germany, resumed its former position of importance as the chief cutting center for synthetics. Favored by low labor rates and devaluation of currency, most synthetic gems used in the American market are now cut in Idar-Oberstein. Toward the end of the year, as large orders piled up and European deliveries became slower, more business was placed in the United States.

---

[4] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 6, June 1950, p. 36.
[5] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 6, December 1950, p. 31.
[6] Australian News and Information Bureau, New York: Vol. 8, No. 4.
[7] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 6, December 1950, p. 31.

Domestic synthetic corundum and spinel production for the year amounted to several million carats. Of this, approximately 70 percent was ruby-color synthetic corundum, 20 percent blue spinel, and the remainder corundum and spinel of other colors. Most of this material was used in educational ring stones, the buff-top, flat-back stones being the most popular style.

Synthetic Rutile (Titania).—During the year public acceptance of this relatively new synthetic gem material increased. When first introduced, the jewelry trade did not respond, but as a result of interest by the amateur lapidaries and direct-mail sales, public interest has been created to a point where the jewelry trade is now beginning to accept and promote titania.

Production has been largely on an experimental basis by the Linde Air Products Co. and the National Lead Co. Prices for boules are about 50 cents per carat for colorless and 75 cents per carat for colored (blue and red).

Synthetic Emerald.—This synthetic gem stone continues to be produced only by the Chatham Research Laboratories in San Francisco, Calif. Production in 1950 amounted to 50,000 carats of rough crystals, of which less than 10 percent was gem quality. No flawless stones of over 2 carats were produced. The retail price for top-quality synthetic emerald is $120 per carat.

Gold and Silver

By James E. Bell

GENERAL SUMMARY

REVERSING the downtrend that prevailed in 1948 and 1949, United States mine production of gold in 1950 rose 20 percent over that of the preceding year and was the largest since 1942. Silver production also was the largest since 1942, the output in 1950 gaining 22 percent over that of 1949. The increase in both gold production and silver production was due mainly to greater yield of byproduct gold and silver resulting from a high level of activity in base-metal mining. General freedom from strikes at the mines and treatment plants was a contributing factor. Impressive gains were made in the straight gold-mining industry, also, reflecting further recovery from the dislocation arising from War Production Board Limitation Order L–208, which restricted gold mining from October 1942 to July 1945. However, the growing inflation, with attendant high costs of labor and materials, combined with the fixed price of gold, has virtually eliminated straight gold mining in some areas.

As in 1949, South Dakota was the leading State in gold production in 1950. California, in second place in 1949, was forced into third place in 1950 by Utah. These three States, with Alaska, supplied 72 percent of the United States total. The South Dakota output was obtained almost entirely from gold ore produced at the Homestake mine; Utah gold was principally a byproduct from the treatment of copper ore mined in the West Mountain (Bingham) district; California production came mainly from straight gold-mining operations, both lode and placer; and Alaska production was almost entirely from placer operations, mainly bucket-line dredging. Of the gold produced in 1950, 26 percent was recovered by placer methods, 35 percent by amalgamation and cyanidation, and 39 percent in the smelting of ores and concentrates.

Idaho maintained its position as the leading silver-producing State by a very wide margin, followed in order by Utah, Montana, and Arizona, the same since 1943. These four States supplied 83 percent of the domestic silver output of 1950. Over half of the Idaho production was recovered from dry ore, but most of the rest from the four leading States was byproduct silver from ores mined principally for base metals. Approximately 98 percent of the domestic silver production was recovered by the smelting of concentrates and ores.

World production of gold outside the United States was nearly the same in 1950 as in 1949. Slight declines in the Union of South Africa, Australia, and elsewhere were more than offset by gains in other gold-producing countries, mostly in Canada. In the Rand district of South Africa, the gold-mining industry has continued to benefit from devaluation in September 1949 of the South African pound. A larger volume of lower-grade ore was mined at greater total profit, despite a substantial rise in working costs. World production of silver outside the United States rose 8 percent in 1950 over the preceding year, due mainly to substantial increases in Canada and Peru. The world production rates of gold and silver in recent years have been far below prewar averages.

With completion of several shafts and considerable horizontal underground work, the new gold field in the Orange Free State 150 miles south-southwest of Johannesburg approached the production stage. Thirteen separate properties were in development in 1950, and two were scheduled to start milling ore in 1951. Extensive exploratory drilling has indicated that the new field may ultimately rival the famous Rand district as a major gold producer.

Pressure for a higher price for gold continued to mount in 1950. Restrictions on the international movement of gold imposed by governments in recent years have led to black markets for gold in many parts of the world. The International Monetary Fund expressed its apprehension over such developments in a statement issued by its Executive Board in June 1947, as follows:

> Exchange stability may be undermined by continued and increasing external purchases and sales of gold at prices which directly or indirectly produce exchange transactions at depreciated rates. From information at its disposal, the Fund believes that unless discouraged this practice is likely to become extensive, which would fundamentally disturb the exchange relationships among the members of the Fund. Moreover, these transactions involve a loss to monetary reserves, since much of the gold goes into private hoards rather than into central holdings. For these reasons, the Fund strongly deprecates international transactions in gold at premium prices and recommends that all of its members take effective action to prevent such transactions in gold with other countries or with nationals of other countries.

The Union of South Africa took the position that the gold producers were being required to make "disproportionate sacrifices" in the Fund's program for monetary and exchange stabilization. In September 1949 the Governor for the Union of South Africa proposed to the Governors of the Fund the following resolution:

* * * * * * *

> SO THEREFORE, it is now Resolved by the Governors of the International Monetary Fund that nothing in the Articles of Agreement of the Fund shall be interpreted to prevent the sale, by the Government of any member of newly-mined gold in any market at such premium prices as may be ruling in that market provided the said member sells to the Fund or to one or more members of the Fund, or transfers to its own monetary reserves at least fifty percent of its newly-mined gold at the price from time to time current in terms of the Articles of Agreement of the Fund.

In a statement dated April 24, 1950, entitled "Report on External Transactions in Gold at Premium Prices," the Executive Board recommended that the Board of Governors do not adopt the resolution of the Governor for the Union of South Africa. The report, however, contains the following paragraph:

> The Fund has not overlooked the problems arising in connection with domestic transactions in gold at prices above parity. The conclusion was reached that the Fund would not object at this time to such transactions unless they have the effect of establishing new rates of exchange or undermining existing rates of other members, or unless they result in a significant weakening of the international financial position of a member which might affect its utilization of the Fund's resources.

This concession led to the sale of a considerable portion of newly mined gold at premium price in some of the gold-producing countries.

The position expressed in the South African resolution had found wide support among United States gold miners. Other United States interests, however, supported the Fund's position, in the belief that an increased quantity of gold available for hoarding would absorb funds, particularly in Economic Cooperation Administration countries, that otherwise would be available for foreign exchange support and for import of materials needed in economic rehabilitation. As a result, it was argued that the demands on the United States Government for grants and other support would be increased and in effect the United States would finance, in part at least, accumulation of gold in foreign privately held hoards.

The premiums paid by foreign hoarders for gold are difficult to determine. Much of the trade has been conducted in black markets, in violation of laws, with attendant secrecy. It is stated, however, that, in continental centers, prices continued to trend downward in 1950, ranging from $38 to $40 an ounce. In the Philippines, prices ranged up to $50 or more an ounce but are said to have declined greatly with strict enforcement of existing laws prohibiting private export of gold.

In the United States, the legality of domestic trade and holding of gold in its "natural" state was established under section 19 of the Provisional Regulations of the Gold Reserve Act of 1934 in these terms:

> Gold in its natural state may be acquired, transported within the United States * * * without the necessity of holding a license therefor.

As a result, much publicity was given in 1948 and 1949 to the possibilities of producers developing a premium market for their product among hoarders preferring gold to currency and speculators anticipating a rising price for gold. However, production that could qualify as "natural" gold suitable for trading was limited to placer gold recoverable without the use of quicksilver and to free lode gold recoverable from the ore mechanically or by washing. Most placer gold is recovered by amalgamation and most lode gold by metallurgical processes.

Considerable confusion existed in the public mind regarding permissible practices in the sale, purchase, and holding of "natural" or unprocessed gold, and in June 1950 the Treasury Department issued a statement explaining the regulations in detail:

> Section 54.19 of the Regulations issued under the Gold Reserve Act of 1934 is interpreted by the Treasury Department as permitting the purchase, sale and transportation of gold in its natural state, as defined therein, without the necessity of holding a license.
>
> Section 54.19 provides, in part, that gold recovered from natural sources which has not been melted, smelted or refined or otherwise treated by heating or by a chemical or electrical process may be acquired, transported within the United States, imported, or held in custody for domestic account without the necessity of holding a license therefor.
>
> The restriction "for domestic account" is interpreted to limit the privileges granted by section 54.19 to residents of the continental United States.
>
> Although gold in its natural state may be purchased, sold and transported within the United States, without the necessity of a license, it may not be exported without a license. The Treasury grants such licenses only for the purpose of sending the gold out of the country for refining or processing, and under the condition that an equivalent amount of gold in refined or processed form would be returned to the United States.
>
> Further, except as provided in section 54.19, gold in its natural state may be melted or treated only under an appropriate Treasury gold license.

Section 54.19 of the Regulations makes specific reference to gold amalgam resulting from the addition of mercury to gold in its natural state. Such gold amalgam may be dealt with in the same manner as gold in its natural state, although it is subject to all the restrictive provisions of section 54.19 of the Regulations. The Mints or Assay Offices do not purchase gold in the form of amalgam.

Section 54.19 provides that gold amalgam which results from the addition of mercury to gold in its natural state recovered from natural deposits in the United States or a place subject to the jurisdiction thereof, may be heated to a temperature sufficient to separate the mercury from the gold (but not to the melting temperature of gold) without a license by the person who recovered the gold from such deposits, or his duly authorized agent or employee. The retort sponge resulting from such heating of such gold amalgam may be held and transported by such person without a license; provided, however, that no such person may hold at any one time an amount of such retort sponge which exceeds in fine gold content 200 troy ounces. Such retort sponge may be acquired from such persons by the United States or by persons holding Federal gold licenses authorizing the purchase of such gold.

In other words, no license is needed for any resident of the United States to acquire, hold, or dispose of, in this country, gold in its natural state as defined in section 54.19 of the Gold Regulations. Nor is a license needed for miners to retort gold in its "natural state" recovered by them from natural deposits in the United States, provided they fully comply with the requirements of section 54.19. However, it is a violation of the Gold Reserve Act of 1934, and the Gold Regulations issued thereunder, for an unlicensed person to retort gold purchased by him from miners or other persons, and sell the retort sponge resulting therefrom; or, for persons, other than those holding licenses authorizing them to do so, to purchase from miners or other persons retort sponge and resell the same.

Section 54.35 of the Gold Regulations provides that the Mints, subject to the conditions specified in the Regulations in Subpart F, are authorized to puchase gold recovered from natural deposits in the United States. However, section 54.38 sets forth the conditions under which such gold will be purchased and provides three forms of statements to be filed with deposits. You will note that these statements refer to deposits (1) by persons who have recovered such gold by mining or panning themselves or (2) who have recovered such gold from gold-bearing materials in the regular course of their business or (3) who have purchased such gold *directly* from persons who have mined or panned such gold. There is no provision in the Regulations authorizing the Mints to purchase such gold from persons other than those enumerated above.

Gold in melted or treated form may be sold or disposed of *only* by a person or concern operating under a Treasury gold license authorizing the disposition of gold in such form.

The Secretary of the Treasury, subject to the approval of the President, has authority to revoke or modify the Gold Regulations.

Special canvasses were made in 1948 and 1949 to determine the quantity of "natural" gold sold at premium prices and the amount of the premiums. Most of the producers reported no such sales in either year. Not all those reporting were willing to furnish data on quantities sold and premiums received. However, it is estimated that "natural" domestic gold containing 25,000 ounces of fine gold reached the premium market in 1948 and 29,000 ounces in 1949. In 1949 approximately 75 percent of the metal was mined in Alaska and most of the remainder in California. Although there were rumors of high premiums, an extensive field check indicated some sales at up to $43 an ounce or a little higher in 1948 and an average price of $39 to $40 in 1949. "Natural" domestic gold continued to be legally sold on the open market in 1950, but information available to the Bureau of Mines indicates that sales were considerably less than in 1949. Some sellers were asking a premium of $5 an ounce over the Treasury price for gold to pay for the extra handling necessary to obtain a clean product.

Mint receipts in early 1950 included a disproportionate quantity reported as having been recovered in 1949, showing that some pro-

TABLE 1.—Salient statistics of gold and silver in the United States,[1] 1941–45 (average) and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Mine production, fine ounces:						
Gold	2,304,951	1,574,505	2,109,185	2,014,257	1,991,783	2,394,231
Silver	45,219,492	22,914,604	35,823,563	38,096,031	34,674,952	42,459,014
Ore (dry and siliceous) produced (short tons):						
Gold ore	6,340,032	2,395,500	3,523,715	3,261,194	3,376,139	3,584,360
Gold-silver ore	761,227	389,681	366,454	569,760	412,378	433,461
Silver ore	669,678	209,626	344,649	370,647	476,960	627,349
Percentage derived from—						
Dry and siliceous ores:						
Gold	47	40	39	39	45	43
Silver	32	24	26	27	24	33
Base-metal ores:						
Gold	27	23	29	31	28	31
Silver	68	75	74	73	76	67
Placers:						
Gold	26	37	32	30	27	26
Silver	(2)	(2)	(2)	(2)	(2)	(2)
Net industrial consumption:						
Gold	$75,376,480	$153,687,000	$48,900,000	$44,986,000	$108,842,471	$97,845,753
Silver, fine ounces	107,646,203	87,000,000	98,500,000	105,289,000	88,000,000	110,000,000
Imports:						
Gold	$321,513,779	$532,961,768	$2,079,588,406	$1,981,175,178	$771,390,261	$162,748,661
Silver	$33,342,191	$57,577,888	$68,140,343	$70,884,513	$73,535,694	$110,035,107
Exports:						
Gold	$238,443,372	$221,467,636	$213,240,800	$300,771,144	$84,935,678	$534,035,794
Silver	$51,242,899	$36,454,690	$30,648,742	$12,400,060	$23,281,043	$6,201,874
Monetary stocks (end of year):[3]						
Gold	----------	$20,529,000,000	$22,754,000,000	$24,244,000,000	$24,427,000,000	$22,706,000,000
Silver, fine ounces	----------	1,951,000,000	1,953,000,000	1,952,000,000	1,978,000,000	1,983,000,000
Price, average, per fine ounce:						
Gold[4]	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00
Silver[5]	$0.711+	$0.808	$0.905+	$0.905+	$0.905+	$0.905+
World production, fine ounces (estimated):						
Gold	31,512,000	27,600,000	28,900,000	29,800,000	30,800,000	31,600,000
Silver	212,673,200	135,000,000	167,700,000	173,400,000	174,000,000	192,000,000

[1] Philippine Islands and Puerto Rico excluded.
[2] Less than 0.5 percent.
[3] Owned by Treasury Department; privately held coinage not included.
[4] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[5] Treasury buying price for newly mined silver.

ducers were accepting the Treasury price for gold they had been holding for the premium market.

The United States Treasury buying price for gold throughout 1950 continued at $35 per fine troy ounce.

International trade in silver was dominated by the regulations of various governments. The United States Treasury continued to purchase silver mined domestically after July 1, 1946, at $0.9050505+ per fine troy ounce, a price normally well above the New York price for metal that could not qualify for Treasury acceptance. The continued ban on imports imposed in India resulted in the Bombay silver market operating almost completely on an internal basis. In 1950 Mexico banned the export of silver during April and early part of May. The price of silver on the New York market in 1950 ranged from a low of $0.7175 to a high of $0.8000 an ounce 0.999 fine. Corresponding prices in 1949 were $0.7000 and $0.7325, respectively.

Silver consumed for coinage, particularly for Canada, China, Mexico, Syria, Venezuela, and the United States totaled approximately 42,000,000 fine ounces, of which over half was for United States coinage.

The net inflow of gold, which resumed in 1946 after a period when war expenditures had depleted United States holdings, continued through August 1949 and resulted in new all-time monthly highs in United States stocks. The inflow was reversed in September 1949, however, and United States stocks declined sharply in 1950; this outflow was largely a consequence of credits extended to foreign countries under the Marshall Plan. The net inflow of silver, also resumed in 1946, has continued steadily through 1950; compared with that of 1949, the inflow of silver in 1950 was 107 percent greater.

DOMESTIC PRODUCTION

Production of gold and silver in the United States is measured at mines and refineries. Both measures are tabulated by States of origin, but there is a small annual variation between them, explained largely by time lag. Over a period of years, the deviations are found to be negligible. Compared with the mine reports compiled by the Bureau of Mines, the refinery reports compiled by the Bureau of the Mint in cooperation with the Bureau of Mines for the 46 years, 1905-50 show a total excess of gold of 78,840 ounces (a difference of 0.05 percent) and a total excess of silver of 15,682,203 ounces (a difference of 0.63 percent).

TABLE 2.—Gold and silver produced in the United States, 1905–50, in fine ounces, according to mine and mint returns, in terms of recoverable metals

Year	Mine		Mint	
	Gold	Silver	Gold	Silver
1905–45	143, 693, 707	2, 315, 962, 406	143, 992, 699	2, 329, 440, 674
1946	1, 574, 505	22, 914, 604	1, 462, 354	21, 103, 269
1947	2, 109, 185	35, 823, 563	2, 165, 318	38, 587, 069
1948	2, 014, 257	38, 096, 031	2, 025, 480	39, 228, 468
1949	1, 991, 783	34, 674, 952	1, 921, 949	34, 944, 554
1950	2, 394, 231	42, 459, 014	2, 288, 708	42, 308, 739
Total 1905–50	153, 777, 668	2, 489, 930, 570	153, 856, 508	2, 505, 612, 773

MINE PRODUCTION

During the war years 1943–45, for the first time on record, over half of the domestic gold output was recovered from base-metal ores; but in the years since, dry ores and placer gravels together have exceeded base-metal ores in yield of gold. This recovery in gold mining, however, has not restored the industry to its prewar level. High wages, difficulties in recruiting labor, and high prices for equipment and supplies, together with an unchanged gold price, retarded recovery. A slight downtrend that began in 1948 and continued through 1949 was reversed sharply in 1950, when production exceeded that of the previous year by 20 percent. Even so, the output in 1950 amounted to only 49 percent of the all-time peak established in 1940.

Silver production, which had declined without interruption from 1940 to 1946, reversed the trend in 1947 and continued to gain through 1948. Production then declined in 1949 but rose 22 percent in 1950. An analysis of silver production, by ores, shows that approximately three-fourths was recovered as a byproduct from base-metal ores from 1945 to 1949 and about two-thirds in 1950. Moreover, all of the silver recovered at placers and part of that produced from dry ores were byproducts of operations carried on chiefly for gold.

TABLE 3.—Mine production of gold and silver in the United States, in 1950, by months, in fine ounces

	Gold	Silver		Gold	Silver
January	164, 247	3, 173, 015	August	228, 866	3, 880, 956
February	171, 808	3, 227, 270	September	232, 878	3, 632, 982
March	189, 396	3, 869, 529	October	223, 157	3, 517, 727
April	185, 404	3, 602, 919	November	206, 627	3, 609, 350
May	194, 640	3, 670, 476	December	199, 549	3, 573, 658
June	193, 508	3, 507, 098			
July	204, 151	3, 194, 034	Total	2, 394, 231	42, 459, 014

All tonnage figures used in this report are short tons of 2,000 pounds "dry weight"; that is, they do not include moisture. Figures in cubic yards used in measuring material treated in placer operations are "bank measure"; that is, the material is measured in the ground before excavation. The weight unit for gold and silver is the troy ounce (480 grains). The totals are calculated upon the basis of recovered or recoverable fine gold and silver shown by assays to be contained in ore, bullion, and other material produced.

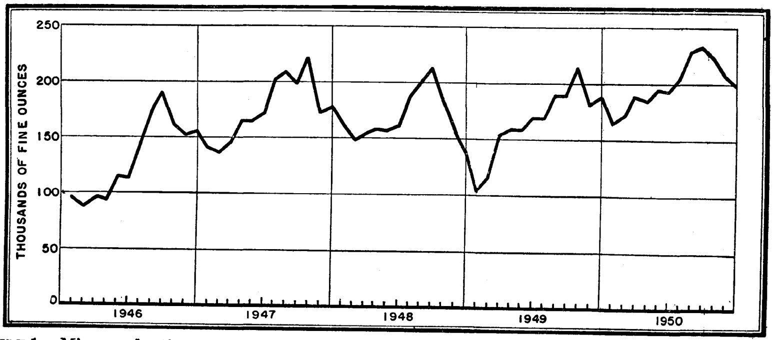

FIGURE 1.—Mine production of gold in the United States, 1946–50, by months, in terms of recoverable gold.

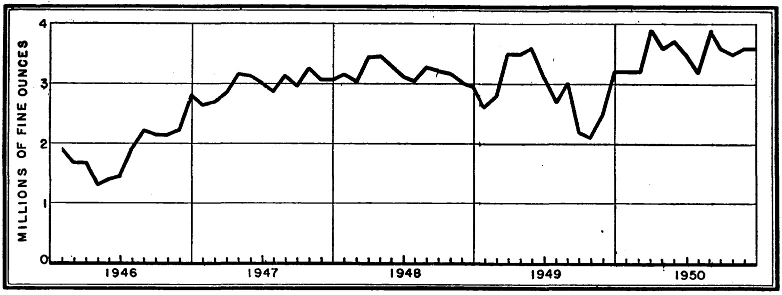

FIGURE 2.—Mine production of silver in the United States, 1946–50, by months, in terms of recoverable silver.

Mines are grouped in two main classes—placers and lodes. The placers are those in which gold and silver (and, in a few placers, platinum) are recovered from gravel as native metals or in natural alloy. Except for such small-scale hand methods as those utilizing the gold pan, the rocker, or the dry washer, all placer recovery methods employ sluice boxes; methods are distinguished by the means used for delivering the gravel to the sluices. Those methods where gravel is delivered mechanically include bucket-line dredging, dragline dredging, and treatment in nonfloating washing plants of gravel delivered by power shovel, dragline excavator, truck, slack-line scraper, or other mechanical means. In the hydraulic method the gravel is mined from the bank by a powerful jet of water; in some small-scale hand methods the gravel is shoveled into sluices; and in drift operations the gravel is mined underground and delivered to sluices at the surface. The lode mines are those yielding gold and silver from ore (as distinguished from gravel), mainly from underground workings and, in addition to those worked chiefly for one or both of the precious metals, include those that yield ore mined chiefly for copper, lead, zinc, or other metals but contribute the precious metals as byproducts. As far as possible, the mine unit used is not the operator but the mining claim or group of claims.

PRINCIPAL MINING DISTRICTS AND LEADING MINES

Lawrence County (Lead), S. Dak., which had been the leading gold producer for many years, was surpassed in 1943, 1944, and 1945 by the West Mountain (Bingham), Utah, copper district. In 1946 Lawrence County regained the lead, a position held through 1950; the West Mountain district has ranked second in this period. Third place was held by the Grass Valley-Nevada City gold-ore district, California, in 1949 and 1950.

The leading silver districts for many years have included many noted more for base-metal output than for silver yield, and this condition was unchanged in 1950. The three leading districts produced about two-thirds of the total United States output of silver in 1950.

Of the 25 leading gold-producing mines, 10 were lode-gold mines, 7 were placers worked by bucket-line dredges, 3 were copper mines, 2 were zinc-lead mines, and 1 was a zinc-copper mine; 2 produced more than 1 type of ore. The 3 leading mines contributed 44 percent of the total gold produced in the United States in 1950 and the 25 on the list, 75 percent.

TABLE 4.—Mine production of recoverable gold in the United States, 1941–45 (average) and 1946–50, by districts that produced 10,000 fine ounces or more during any year, in fine ounces [1]

District or region	State	1941–45 (average)	1946	1947	1948	1949	1950
Lawrence County	South Dakota	258,025	312,246	407,192	377,836	464,650	567,996
West Mountain (Bingham)	Utah	301,469	140,877	384,414	332,588	286,155	428,313
Grass Valley-Nevada City	California	(2)	49,033	68,383	94,398	(2)	(2)
Folsom	do	65,979	93,718	102,121	104,196	98,435	91,260
Chelan Lake	Washington	40,520	32,353	12,024	41,826	(2)	(2)
Yuba River	California	(2)	(2)	(2)	(2)	(2)	(2)
Upper San Miguel	Colorado	20,790	24,648	38,155	38,188	35,217	52,567
Robinson (Ely)	Nevada	60,034	39,234	39,490	37,453	38,703	49,878
Yellow Pine	Idaho	5,989	10,842	31,006	27,158	53,576	48.472
Ajo	Arizona	36,877	33,083	30,477	38,647	38,455	37,632
Potosi	Nevada	(2)	17	---	---	(2)	(2)
Battle Mountain	do	5,996	4,222	(2)	7,982	(2)	(2)
Republic (Eureka)	Washington	23,915	18,563	22,590	28,196	23,751	24,929
Mother Lode	California	64,772	7,271	9,020	(2)	21,948	24.513
Park City Region	Utah	18,242	16,956	17,052	19,087	19,443	24,125
Summit Valley (Butte)	Montana	17,459	6,882	19,777	19,163	15,742	23,092
California (Leadville)	Colorado	21,093	10,749	(2)	(2)	(2)	(2)
Bullion	Nevada	4,580	12,473	17,058	16,676	16,791	20,405
Oroville	California	29,499	17,891	22,589	20,800	22,701	(2)
Big Bug	Arizona	9,163	8,629	9,720	11,058	14,035	19,328
Fairplay	Colorado	6,274	(2)	(2)	8,489	(2)	(2)
Pioneer (Superior)	Arizona	8,579	7,260	9,339	10,054	12,839	14,392
Alleghany	California	(2)	8,477	7,779	(2)	(2)	14,314
Warren (Bisbee)	Arizona	46,345	5,680	20,131	19,083	11,837	13,695
Animas	Colorado	21,138	15,905	18,496	13,428	10,658	12,874
Scott River	California	(2)	(2)	(2)	(2)	(2)	12,289
Round Mountain	Nevada	(2)	---	6	---	---	(2)
Comstock	do	17,142	5,419	5,028	11,591	18,540	9,691
Verde (Jerome)	Arizona	19,163	8,132	6,931	11,374	10,790	9,421
La Grange	California	9,589	(2)	(2)	(2)	(2)	(2)
Snelling	do	(2)	3,732	(2)	(2)	(2)	(2)
Cosumnes River	do	9,610	(2)	10,691	13,956	(2)	(2)
Camanche	do	(2)	13.933	9,229	(2)	(2)	(2)
Cripple Creek	Colorado	68,488	47,640	58,158	53,569	13,460	5,779
Boise Basin	Idaho	7,787	7,758	7,894	11,732	4,789	4,942
Tintic	Utah	19,238	17,799	15,385	11,007	5,133	3,277
Klamath River	California	(2)	5,853	11,295	5,033	2,584	1,181
Manhattan	Nevada	15,975	13,478	1,618	782	1,031	688
Sheepeater	Montana	4,618	9,822	10,140	6,498	---	---

[1] Exclusive of Alaska.
[2] Figure withheld to avoid disclosure of individual company operations.

TABLE 5.—Mine production of recoverable silver in the United States, 1941–45 (average) and 1946–50, by districts and regions that produced 200,000 fine ounces or more during any year, in fine ounces

District or region	State	1941–45 (average)	1946	1947	1948	1949	1950
Coeur d'Alene Region	Idaho	10, 748, 700	5, 655, 672	9, 234, 906	10, 598, 338	9, 146, 146	15, 056, 131
Summit Valley (Butte)	Montana	6, 897, 867	2, 417, 422	5, 251, 095	6, 099, 790	5, 635, 101	6, 121, 264
West Mountain (Bingham)	Utah	4, 791, 138	2, 030, 182	4, 816, 611	4, 694, 674	4, 316, 378	4, 963, 586
Warren (Bisbee)	Arizona	1, 984, 262	721, 135	1, 522, 558	1, 432, 172	1, 166, 210	1, 079, 311
Park City Region	Utah	2, 073, 669	1, 009, 422	1, 352, 748	1, 703, 864	1, 061, 902	952, 632
Tintic	do	1, 696, 524	619, 724	1, 076, 726	1, 123, 460	914, 150	924, 722
Copper Mountain (Morenci)	Arizona	206, 562	265, 151	540, 232	605, 153	606, 111	754, 591
Upper San Miguel	Colorado	283, 544	355, 604	392, 540	526, 742	579, 498	730, 860
Big Bug	Arizona	287, 326	338, 062	386, 452	425, 079	581, 351	701, 973
Red Cliff	Colorado	1, 021, 485	57, 353	233, 351	416, 032	216, 580	669, 461
Pioche (Highland)	Nevada	524, 085	403, 358	426, 229	684, 321	708, 216	608, 710
Coso (Darwin)	California	204, 312	871, 091	1, 093, 709	393, 761	352, 482	600, 440
Animas	Colorado	354, 592	339, 088	362, 888	417, 887	539, 402	564, 321
Pioneer (Superior)	Arizona	526, 757	243, 667	314, 126	308, 448	401, 202	529, 186
Warm Springs	Idaho	637, 505	418, 599	427, 242	266, 226	468, 302	502, 973
Ajo	Arizona	399, 216	390, 401	353, 789	455, 411	471, 134	473, 020
Verde (Jerome)	do	1, 035, 489	418, 578	367, 778	408, 669	509, 828	456, 254
Creede	Colorado	658, 841	355, 110	317, 712	297, 926	263, 867	345, 247
Resting Springs	California	(1)	(1)	(1)	(1)	(1)	(1)
California (Leadville)	Colorado	329, 796	332, 024	(1)	(1)	(1)	(1)
Ash Peak	Arizona	107, 442	49, 271	71, 284	135, 356	147, 958	227, 342
Sand Springs	Nevada	(1)	------	------	164, 413	174, 718	200, 217
Pima (Sierritas, Papago, Twin Buttes)	Arizona	68, 821	125, 125	143, 653	162, 224	252, 334	182, 540
Bayhorse	Idaho	219, 391	84, 052	204, 264	166, 246	87, 130	157, 031
Harshaw	Arizona	247, 213	105, 672	168, 800	210, 533	140, 011	147, 258
Yellow Pine	Idaho	91, 146	78, 094	255, 043	236, 031	92, 439	137, 073
Comstock	Nevada	201, 959	50, 854	68, 621	176, 882	233, 705	108, 944
Rush Valley	Utah	(1)	(1)	(1)	(1)	(1)	(1)
Ten Mile	Colorado	35, 327	88, 995	106, 481	271, 944	254, 294	68, 289
Virginia City	Montana	31, 760	236, 318	96, 515	225, 784	84, 918	66, 267

[1] Figure withheld to avoid disclosure of individual company operations.

TABLE 6.—Twenty-five leading gold-producing mines in the United States in 1950, in order of output

Rank	Mine	District	State	Operator	Source of gold
1	Homestake	Whitewood	South Dakota	Homestake Mining Co	Gold ore.
2	Utah Copper	West Mountain (Bingham)	Utah	Kennecott Copper Corp	Copper ore.
3	Fairbanks Unit	Fairbanks	Alaska	U. S. Smelting, Refining & Mining Co	Dredge.
4	Natomas	Folsom	California	Natomas Co	Do.
5	Yuba Unit	Yuba River	do	Yuba Consolidated Gold Fields	Do.
6	New Brunswick-Idaho-Maryland	Grass Valley-Nevada City	do	Idaho Maryland Mines Corp	Gold ore.
7	Yellow Pine	Yellow Pine	Idaho	Bradley Mining Co	Do.
8	Nome	Nome	Alaska	U. S. Smelting, Refining & Mining Co	Dredge.
9	Empire Star group	Grass Valley-Nevada City	California	Empire Star Mines, Ltd	Gold ore.
10	Ruth Pit [1]	Robinson (Ely)	Nevada	Kennecott Copper Corp	Copper ore.
11	New Cornelia	Ajo	Arizona	Phelps Dodge Corp	Do.
12	Holden	Chelan Lake	Washington	Howe Sound Co	Zinc-copper ore.
13	Getchell & Pinson-Ogee	Potosi	Nevada	Getchell Mines, Inc	Gold ore.
14	Gold King	Wenatchee	Washington	Lovitt Mining Co	Do.
15	Smuggler-Union, etc	Upper San Miguel	Colorado	Telluride Mines, Inc	Do.
16	Treasury Tunnel-Black Bear	do	do	Idarado Mining Co	Zinc-lead-copper ore.
17	Greenan Placers	Battle Mountain	Nevada	Natomas Co	Dredge.
18	Knob Hill	Republic (Eureka)	Washington	Knob Hill Mines, Inc	Gold ore.
19	Butte Hill mines and dumps [2]	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Copper, zinc-lead ores.
20	Park Galena-Mayflower	Park City	Utah	New Park Mining Co	Zinc-lead ore.
21	Goldacres	Bullion	Nevada	London Extension Mining Co	Gold ore.
22	Iron King & Ext	Big Bug	Arizona	Shattuck Denn Mining Corp	Zinc-lead ore.
23	Old Eureka	Mother Lode	California	Central Eureka Mining Co	Gold ore.
24	New York Alaska Gold Dredging Corp	Tuluksak-Aniak	Alaska	New York Alaska Gold Dredging Corp	Dredge.
25	Butte Unit	Oroville	California	Yuba Consolidated Gold Fields	Do.

[1] Shown as "Ruth & Copper Flat" in 1949 chapter.
[2] Shown as "Butte Mines" in 1949 chapter.

232294—53——37

TABLE 7.—Twenty-five leading silver-producing mines in the United States in 1950, in order of output

Rank	Mine	District	State	Operator	Source of silver
1	Butte Hill mines and dumps [1]	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Copper, zinc-lead ores.
2	Sunshine	Evolution	Idaho	Sunshine Mining Co	Silver ore.
3	Utah Copper	West Mountain (Bingham)	Utah	Kennecott Copper Corp	Copper ore.
4	Bunker Hill & Sullivan	Yreka	Idaho	Bunker Hill and Sullivan Mining & Concentrating Co.	Zinc-lead ore.
5	Polaris	Evolution	do	Polaris Mining Co	Silver ore.
6	United States & Lark	West Mountain (Bingham)	Utah	U. S. Smelting, Refining & Mining Co	Gold-silver, lead, silver, zinc-lead ores.
7	Coeur d'Alene	Evolution	Idaho	Silver Summit Mining Co	Silver ore.
8	Copper Queen	Warren (Bisbee)	Arizona	Phelps Dodge Corp	Copper, zinc-lead ores.
9	St. Germaine-Purim	Evolution	Idaho	Silver Dollar Mining Co	Silver ore.
10	Morenci	Copper Mountain	Arizona	Phelps Dodge Corp	Copper ore.
11	Chief and Eureka Hill	Tintic	Utah	Chief Consolidated Mining Co	Zinc-lead, lead, silver ores.
12	Iron King & Ext	Big Bug	Arizona	Shattuck Denn Mining Corp	Zinc-lead ore.
13	Eagle mine group	Redcliff	Colorado	New Jersey Zinc Co	Gold-silver ore.
14	Darwin group	Coso (Darwin)	California	Anaconda Copper Mining Co	Zinc-lead, lead ores.
15	Pioche group	Pioche (Highland)	Nevada	Combined Metals Reduction Co	Zinc-lead ore.
16	Page group	Yreka	Idaho	Federal Mining & Smelting Co	Do.
17	Magma	Pioneer (Superior)	Arizona	Magma Copper Co	Copper, zinc-copper ores.
18	Treasury Tunnel-Black Bear	Upper San Miguel	Colorado	Idarado Mining Co	Zinc-lead-copper ore.
19	Independence	Warm Springs	Idaho	Triumph Mining Co	Zinc-lead ore.
20	Silver Syndicate	Evolution	do	Silver Syndicate, Inc	Silver ore.
21	New Cornelia	Ajo	Arizona	Phelps Dodge Corp	Copper ore.
22	United Verde	Verde (Jerome)	do	do	Copper, zinc-copper ores.
23	Shenandoah, etc	Animas	Colorado	Shenandoah-Dives Mining Co	Gold-silver ore.
24	Park Galena-Mayflower	Park City	Utah	New Park Mining Co	Zinc-lead ore.
25	Amethyst, etc	Creede	Colorado	Emperius Mining Co	Do.

[1] Shown as "Butte Mines" in 1949 chapter.

TABLE 8.—Mine production of recoverable gold in the United States, 1940–50, with production of maximum year, and cumulative production from earliest record to end of 1950, by States, in fine ounces

	Maximum production [1]		Production by years											Total production from earliest record to end of 1950
	Year	Quantity	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	
Western States and Alaska:														
Alaska	1906	1,066,030	755,970	695,467	487,621	99,583	49,296	68,117	226,781	279,988	248,395	229,416	289,272	27,130,499
Arizona	1937	332,694	294,807	315,392	253,651	171,810	112,162	77,223	79,024	95,860	109,487	108,993	118,313	11,300,812
California	1852	3,932,631	1,455,671	1,408,793	847,997	148,328	117,373	147,938	356,824	431,415	421,473	417,231	412,118	103,563,456
Colorado	1900	1,391,364	367,336	380,029	268,627	137,558	111,455	100,935	142,613	168,279	154,802	102,618	130,390	39,614,032
Idaho	1871	212,850	146,480	149,816	95,020	30,808	25,008	17,780	42,975	64,982	58,454	77,829	79,652	8,121,666
Montana	1865	870,750	272,602	246,475	146,892	59,586	50,021	44,597	70,507	90,124	73,091	52,724	51,764	17,319,824
Nevada	1910	913,265	383,933	366,403	295,112	144,442	119,056	92,265	90,680	89,063	111,532	130,399	178,447	26,026,442
New Mexico	1915	70,681	35,943	27,845	11,961	5,563	6,918	5,604	4,009	3,146	3,414	3,249	3,414	2,196,058
Oregon	1940	113,402	113,402	96,565	46,233	1,097	1,369	4,467	17,598	18,979	14,611	16,226	11,058	5,752,426
South Dakota	1939	618,536	586,662	600,637	522,098	106,444	11,621	55,948	312,247	407,194	377,850	464,650	567,996	22,863,991
Texas	1929	1,279	312	306	236	4			9	45	57	40	49	8,481
Utah	1950	457,551	355,494	356,501	391,544	390,470	344,223	279,979	178,533	421,662	368,422	314,058	457,551	12,204,671
Washington	1950	92,117	82,136	84,176	75,396	65,244	47,277	57,860	51,168	34,965	70,075	71,994	92,117	2,447,821
Wyoming	1869	7,498	740	478	23		20	2	105	1,486	115	389		80,031
Total			4,851,488	4,728,883	3,442,411	1,360,937	995,799	952,715	1,573,073	2,107,188	2,011,778	1,989,816	2,392,141	278,630,210
West Central States: Missouri	1900	33												33
States east of the Mississippi:														
Alabama	1936	4,726	5	30	1			5	1					49,495
Georgia	1882	12,094	961	311	30	12	5		21	76	19	18		870,660
Indiana	(2)	(2)	5											(3)
Maryland	1937	1,040											20	6,122
Michigan	1890	4,354												33,297
North Carolina	1887	10,884	1,943	3,244	4,077	131	21					13		1,164,601
Pennsylvania	1942	2,499	1,840	2,422	2,499	2,218	2,115	1,588	1,150	1,518	2,200	1,645	1,764	[4] 32,411
South Carolina	1941	15,508	13,076	15,508	7,824	147								318,801
Tennessee	1930	696	173	227	159	303	222	148	95	303	156	171	160	21,755
Vermont	1946	165				17	100	104	165	100	104	120	146	[5] 889
Virginia	1938	2,943	458	240	109	50	132	12						167,558
Total			18,461	21,982	14,699	2,878	2,595	1,857	1,432	1,997	2,479	1,967	2,090	2,665,589
Grand total			4,869,949	4,750,865	3,457,110	1,363,815	998,394	954,572	1,574,505	2,109,185	2,014,257	1,991,783	2,394,231	281,295,832

[1] For Central and Eastern States figures are peaks since 1880, except Pennsylvania and Vermont, for which the figures are peaks since 1905. For Alaska, Nevada, and Oregon figures are likewise peaks since 1880 only.
[2] Figure not available.
[3] Small, figure not available.
[4] 1908–50 only.
[5] 1905–50 only.

TABLE 9.—Mine production of recoverable silver in the United States, 1940–50, with production of maximum year, and cumulative production from earliest record to end of 1950, by States, in fine ounces

	Maximum production [1]		Production by years											Total production from earliest record to end of 1950
	Year	Quantity	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	
Western States and Alaska:														
Alaska	1916	1,379,171	191,679	191,522	119,704	42,788	13,362	9,983	41,793	66,150	67,341	36,056	52,638	20,012,483
Arizona	1937	9,422,552	7,075,215	7,498,260	7,064,467	5,713,889	4,394,039	3,558,216	3,268,765	4,569,084	4,837,740	4,970,736	5,325,441	312,390,415
California	1921	3,629,223	2,359,776	2,154,188	1,450,440	609,075	778,936	986,798	1,342,651	1,597,442	724,771	783,880	1,071,917	112,378,098
Colorado	1893	25,838,600	9,710,709	7,301,697	3,096,211	2,664,142	2,248,830	2,226,780	2,240,151	2,557,653	3,011,011	2,894,886	3,492,278	742,382,506
Idaho	1937	19,587,766	17,552,240	16,672,410	14,644,890	11,700,180	9,931,614	8,142,667	6,491,104	10,345,779	11,448,875	10,049,257	16,095,019	568,424,342
Montana	1892	19,038,800	12,361,050	12,386,925	11,188,118	8,450,370	7,093,215	5,942,070	3,273,140	6,326,190	6,930,716	6,327,025	6,590,747	775,324,501
Nevada	1913	16,090,083	5,175,928	5,830,238	3,723,435	1,620,280	1,259,636	1,043,380	1,250,651	1,377,579	1,790,020	1,800,209	1,537,217	596,108,737
New Mexico	1885	2,343,800	1,407,839	1,328,317	676,170	463,583	535,275	465,127	338,000	515,833	537,674	380,855	338,581	69,527,674
Oregon	1941	276,158	219,112	276,158	87,376	10,523	20,243	10,461	6,927	30,379	13,596	12,195	13,565	5,295,047
South Dakota	1900	536,200	175,514	170,771	186,937	35,886	5,445	26,564	86,901	111,684	94,693	109,383	142,065	10,145,834
Texas	1938	1,433,008	1,326,150	1,096,027	672,781	10,284	5,355	23,265	42,922	20,547	3,065	2,691	2,454	33,297,120
Utah	1925	21,276,689	12,172,299	11,395,485	10,574,955	9,479,340	7,593,075	6,106,545	4,118,453	7,780,032	8,045,329	6,724,880	7,083,808	748,806,568
Washington	1902	721,450	365,175	402,030	369,038	370,440	321,608	281,444	264,453	293,736	375,831	357,853	363,656	14,220,949
Wyoming	1901	21,400	114	94	52	-----	3	31	26	95	11	21	-----	74,819
Total		-----	70,092,800	66,704,122	53,854,574	41,170,780	34,200,636	28,823,331	22,765,937	35,592,183	37,880,673	34,449,927	42,109,386	4,008,389,093
West Central States: Missouri	1938	292,000	147,306	169,027	69,106	111,285	92,243	94,822	69,401	93,600	114,187	123,413	236,273	4,729,470
States east of the Mississippi:														
Alabama	1936	869	3	3	-----	-----	-----	1	-----	-----	-----	-----	-----	5,239
Georgia	1904	1,500	630	38	7	-----	-----	-----	-----	13	3	-----	-----	10,963
Illinois	1924	8,891	4,766	8,138	104	2,153	2,437	2,198	2,302	1,790	4,047	3,128	2,001	148,308
Maryland	1917	1,092	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2,595
Michigan	1916	716,640	88,657	60,796	61,674	48,479	54,218	21,863	-----	3,089	-----	-----	-----	10,256,112
New York	1937	41,500	35,720	37,734	40,012	38,004	25,238	14,271	15,786	22,409	18,788	18,378	32,628	481,325
North Carolina	1906	30,769	6,480	7,439	8,259	7,169	1,461	-----	-----	-----	-----	-----	-----	357,223
Pennsylvania	1942	15,501	13,064	15,016	15,501	13,095	13,545	10,434	7,887	9,863	13,731	10,827	10,563	226,538
South Carolina	1940	8,047	8,047	6,525	5,064	135	-----	-----	-----	-----	-----	-----	-----	35,325
Tennessee	1920	110,719	38,610	39,161	34,671	52,058	45,907	35,391	18,016	79,147	39,692	41,833	39,958	3,238,980
Vermont	1946	35,275	-----	-----	-----	2,721	18,862	20,586	35,275	21,469	24,910	27,446	28,205	[2] 206,082
Virginia	1944	18,993	271	135	1,793	14,947	18,993	1,300	-----	-----	-----	-----	-----	79,389
Total	-----	-----	196,248	174,985	167,085	178,761	180,661	106,044	79,266	137,780	101,171	101,612	113,355	15,048,079
Grand total	-----	-----	70,436,354	67,048,134	54,090,765	41,460,826	34,473,540	29,024,197	22,914,604	35,823,563	38,096,031	34,674,952	42,459,014	4,028,166,642

[1] States east of the Mississippi figures are peaks since 1896, except New York and Pennsylvania which are peaks since 1905. The Illinois figure is the peak since 1907. Alaska, California, Nevada, and Oregon are peaks since 1880.

[2] Includes a small quantity for New Hampshire.

Only 5 of the 25 leading silver-producing mines depended exclusively on silver ore; ores valuable chiefly for copper, lead, zinc, and gold were the source of most of the silver output. The nine leading mines, each producing over 1,000,000 ounces of silver in 1950, contributed 55 percent of the United States total. The list of 25 mines supplied 75 percent of the United States output. As several of the mine operators each worked more than one of the leading silver mines in addition to smaller mines, the output of silver by companies was substantially more concentrated than that by mines.

ORE PRODUCTION, CLASSIFICATION, METAL YIELD, AND METHODS OF RECOVERY

Tables 10 to 17 give details of classes of ore, metal yield in fine ounces of gold and silver to the ton, and gold and silver output by classes of ore and by methods of recovery, embracing all ores that yielded gold and silver in the United States in 1950. These tables were compiled from the individual State chapters in this volume, in which more detailed data are presented.

TABLE 10.—Ore produced in the United States and average recovery, in fine ounces, of gold and silver per ton in 1950 [1]

State	Gold ore			Gold-silver ore			Silver ore		
	Short tons	Average ounces per ton		Short tons	Average ounces per ton		Short tons	Average ounces per ton	
		Gold	Silver		Gold	Silver		Gold	Silver
Western States and Alaska:									
Alaska	55,168	0.214	0.026						
Arizona	10,457	.234	.568	4,721	0.071	3.115	48,060	0.020	8.764
California	381,351	.409	.130	2,499	.145	3.896	1,060	.007	7.486
Colorado	229,019	.162	1.407	312,202	.061	3.645	19,071	.016	10.347
Idaho	632,884	.088	.276	748	1.152	18.269	334,163	.002	29.091
Montana	101,985	.203	.761	19,061	.161	5.153	12,729	.026	8.648
Nevada	655,224	.124	.141	75,642	.073	4.367	37,555	.019	3.886
New Mexico	935	.195	.404	1,225	.220	10.401	3,924	.004	4.797
Oregon	3,797	.511	2.380	200	.115	9.430			
South Dakota	1,391,162	.408	.102						
Texas									
Utah	1,234	.222	1.480	17,163	.092	4.478	170,787	.020	3.763
Washington	121,089	.485	1.509						
Wyoming									
Total	3,584,305	.277	.273	433,461	.072	3.913	627,349	.011	17.956
States east of the Mississippi	55	.364							
Total	3,584,360	.277	.273	433,461	.072	3.913	627,349	.011	17.956

For footnotes, see end of table.

TABLE 10.—Ore produced in the United States and average recovery, in fine ounces, of gold and silver per ton in 1950 [1]—Continued

State	Copper ore			Lead ore			Lead-copper ore		
	Short tons	Average ounces per ton		Short tons	Average ounces per ton		Short tons	Average ounces per ton	
		Gold	Silver		Gold	Silver		Gold	Silver
Western States and Alaska:									
Alaska	------	------	------	3,500	0.102	3.629	------	------	------
Arizona	41,757,273	0.002	0.068	13,142	.356	3.890	7	------	42.857
California	2,490	.489	10.776	54,298	.101	8.517	3	1.000	8.667
Colorado	639	.042	20.471	49,164	.043	4.955	1	7.000	109.000
Idaho	787	.011	25.461	182,905	.004	3.996	4	------	2.750
Montana	1,192,789	.003	1.450	24,710	.037	2.444	------	------	------
Nevada	6,693,277	.007	.022	10,906	[2].056	[2]10.617	1,462	.006	8.921
New Mexico	7,510,499	------	.017	18,045	.003	.339	56	.036	9.054
Oregon	------	------	------	------	------	------	------	------	------
South Dakota	------	------	------	------	------	------	------	------	------
Texas	------	------	------	935	.052	2.625	------	------	------
Utah	31,049,641	.013	.107	28,363	.061	6.678	432	.134	13.384
Washington	286	------	1.346	20,217	------	2.380	------	------	------
Wyoming	------	------	------	------	------	------	------	------	------
Total	88,207,681	.006	.093	406,185	.041	4.734	1,965	.040	10.269
States east of the Mississippi	5,720,477	------	.012	10	------	------	------	------	------
Total	93,928,158	.006	.088	406,195	.041	4.734	1,965	.040	10.269

State	Zinc ore			Zinc-lead, zinc-copper, and zinc-lead-copper ores			Total ore		
	Short tons	Average ounces per ton		Short tons	Average ounces per ton		Short tons	Average ounces per ton	
		Gold	Silver		Gold	Silver		Gold	Silver
Western States and Alaska:									
Alaska	------	------	------	------	------	------	58,668	.207	0.241
Arizona	7,159	0.012	0.546	868,453	0.035	2.274	42,709,272	.003	.125
California	18,473	.030	2.704	87,067	.004	5.136	547,241	.299	1.925
Colorado	210,661	.009	.715	551,987	.092	2.728	1,372,744	.081	2.541
Idaho	[3]74,416	------	.394	2,074,308	.002	2.603	[3]3,300,215	.019	4.875
Montana	[4]20,945	------	1.050	2,235,817	.009	2.009	[4]3,608,036	.013	1.827
Nevada	[5]37,539	[5].005	[5].572	233,514	.019	2.829	7,745,119	[2].018	[2].197
New Mexico	335,703	.001	.401	28,667	.001	1.312	7,899,054	------	.043
Oregon	260	.277	3.019	------	------	------	4,257	.478	2.750
South Dakota	------	------	------	------	------	------	1,391,162	.408	.102
Texas	------	------	------	------	------	------	935	.052	2.625
Utah	[6]8,035	.002	.578	579,946	.064	4.914	[6]31,855,601	.014	.222
Washington	62,206	------	.024	1,075,797	.031	.122	1,279,595	.072	.284
Wyoming	------	------	------	------	------	------	------	------	------
Total	775,397	.004	.540	7,735,556	.023	2.262	101,771,899	.017	.413
States east of the Mississippi	1,920,063	------	------	1,558,532	------	.022	[7]9,199,137	(7)	[7].011
Total	2,695,460	.001	.155	9,294,088	.019	1.886	110,971,036	.016	.380

[1] Missouri excluded.
[2] Includes metal recovered from tungsten ore.
[3] Includes 51,366 tons of old lead-smelter slag.
[4] Includes 20,764 tons of zinc slag fumed.
[5] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[6] Includes 3,843 tons of zinc slag.
[7] Excludes magnetite-pyrite-chalcopyrite ore and gold and silver therefrom.

The classification originally adopted in 1905 on the basis of smelter terminology, smelter settlement contracts, and metal recovery has been used continuously in succeeding years, except for modifications necessitated by the improvement in metallurgy and the lowering of the grade of complex ores treated. The copper ores include those smelting ores that contain 2.5 percent dry assay or more of copper (or less than this percentage if no other metal is present); or those ores concentrated chiefly for their copper content. The lead ores are those that contain 5 percent dry assay (minimum lead-smelting charge requires 7.5 to 8.5 percent wet assay) or more of lead, irrespective of precious-metal content; and ore that carries any grade of lead exclusively is called a lead ore. Zinc smelting ores (chiefly oxides) had ranged from 16 to 45 percent zinc; but, with the development of slag fuming, which permits some oxidized ore in the charge, and with high zinc prices, the minimum has declined to as low as 5 percent recoverable zinc. Zinc concentrating ores include any grade of zinc ore that makes marketable zinc concentrate, irrespective of precious-metal content. The mixed ores are combinations of those enumerated.

Gold, gold-silver, and silver ores containing too little copper, lead, or zinc to be classified as copper, lead, zinc, or mixed base-metal ores are called "dry" ores, regardless of the ratio of concentration, except low-grade ore milled chiefly for its copper content and having very little or no precious-metal content (chiefly the "porphyry coppers") and ores from which separate products of lead concentrates and zinc concentrates are made. The crude ore into the mill in these two exceptional instances thus takes its name from its products—a name that is also justified by the mineralogical content and final recovery of metals. The "dry ores" thus are ores, chiefly siliceous, valuable for their gold and silver content and, in some instances, for their fluxing properties, regardless of method of treatment. Dry gold ores are those that by inspection are overwhelmingly of gold content; a similar qualification applies to silver ores; decision as to "gold-silver" ore is made on a basis of value, using the rule that the bimetal classification is not used unless the metal of lower value equals or exceeds one-quarter of the combined value of the gold and silver.

The lead, zinc, and zinc-lead ores in most districts in the States east of the Rocky Mountains carry no appreciable quantity of gold or silver; such ores are excluded from this report unless otherwise indicated.

TABLE 11.—Mine production of gold in the United States, 1941–45 (average) and 1946–50, by percent from sources and in total fine ounces

Year	Percent from—						Total fine ounces
	Placers	Dry ore	Copper ore	Lead ore	Zinc ore	Zinc-lead, zinc-copper, lead-copper, and zinc-lead-copper ores	
1941–45 (average)	25.7	47.0	21.7	0.7	0.2	4.7	2,304,951
1946	37.5	39.5	16.1	.4	.4	6.1	1,574,505
1947	32.2	38.5	23.8	.5	.4	4.6	2,109,185
1948	29.8	39.5	22.4	.5	.2	7.6	2,014,257
1949	26.8	44.8	19.8	.6	.2	7.8	1,991,783
1950	25.5	43.1	23.1	.7	.1	7.5	2,394,231

TABLE 12.—Mine production of silver in the United States, 1941–45 (average) and 1946–50, by percent from sources and in total fine ounces

Year	Percent from—						Total fine ounces
	Placers	Dry ore	Copper ore	Lead ore	Zinc ore	Zinc-lead, zinc-copper, lead-copper, and zinc-lead-copper ores	
1941–45 (average)	0.2	31.6	30.4	6.8	1.2	29.8	45,219,492
1946	.3	24.4	24.4	7.5	2.3	41.1	22,914,604
1947	.2	25.7	23.1	8.0	2.1	40.9	35,823,563
1948	.2	26.6	20.7	5.9	1.5	45.1	38,096,031
1949	.2	23.5	20.0	7.8	1.5	47.0	34,674,952
1950	.2	32.8	19.6	5.1	1.0	41.3	42,459,014

TABLE 13.—Mine production of gold in the United States in 1950, by States, and sources, in fine ounces of recoverable metal

State	Placers	Dry ore	Copper ore	Lead ore	Lead-copper ore	Zinc ore	Zinc-lead, zinc-copper, and zinc-lead-copper ores	Total
Alaska	277,111	11,805		356				289,272
Arizona	142	3,756	79,567	4,685		85	30,078	118,313
California	248,303	156,181	[1] 1,218	5,485	3	563	365	412,118
Colorado	19,413	56,473	27	2,115	7	1,826	50,529	130,390
Georgia								
Idaho	17,561	57,402	9	805		14	3,861	79,652
Maryland		20						20
Montana	3,434	24,150	3,708	908			19,564	51,764
Nevada	36,378	87,335	49,438	[2] 611	9	[3] 172	4,504	[2] 178,447
New Mexico	6	466	2,587	58	2	265	30	3,414
North Carolina								
Oregon	9,022	1,964				72		11,058
Pennsylvania			[4] 1,764					1,764
South Dakota		567,996						567,996
Tennessee			160					160
Texas				49				49
Utah	4	5,317	413,090	1,739	58	19	37,324	457,551
Vermont			146					146
Washington	39	58,729					33,349	92,117
Wyoming								
Total	611,413	1,031,594	551,714	16,811	79	3,016	179,604	2,394,231

[1] Includes metal recovered from tungsten ore and furnace cleanup.
[2] Includes metal recovered from tungsten ore.
[3] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[4] From magnetite-pyrite-chalcopyrite ore.

TABLE 14.—Mine production of silver in the United States in 1950, by States and sources, in fine ounces of recoverable metal

State	Placers	Dry ore	Copper ore	Lead ore	Lead-copper ore	Zinc ore	Zinc-lead, zinc-copper, and zinc-lead-copper ores	Total
Alaska	38, 515	1, 423	----------	12, 700	--------	--------	------------	52, 638
Arizona	----------	441, 839	2, 853, 599	51, 122	300	3, 911	1, 974, 670	5, 325, 441
California	18, 310	67, 128	[1][2] 26, 831	462, 472	26	49, 959	447, 191	1, 071, 917
Colorado	3, 739	1, 575, 070	13, 081	243, 609	109	150, 666	1, 506, 004	3, 492, 278
Georgia	----------	----------	----------	----------	--------	--------	------------	----------
Idaho	5, 308	9, 909, 586	20, 038	730, 867	411	29, 320	5, 399, 489	16, 095, 019
Illinois	----------	----------	----------	----------	--------	--------	2, 001	2, 001
Michigan	----------	----------	----------	----------	--------	--------	------------	----------
Missouri	----------	----------	----------	[3] 236, 273	(3)	--------	------------	236, 273
Montana	327	285, 904	1, 729, 611	60, 389	--------	21, 987	4, 492, 529	6, 590, 747
Nevada	9, 800	568, 888	147, 599	[4] 115, 794	13, 043	[5] 21, 465	660, 628	[4] 1, 537, 217
New Mexico	----------	31, 941	127, 455	6, 122	507	134, 669	37, 887	338, 581
New York	----------	----------	----------	----------	--------	--------	32, 628	32, 628
Oregon	1, 859	10, 921	----------	----------	--------	785	------------	13, 565
Pennsylvania	----------	----------	[6] 10, 563	----------	--------	--------	------------	10, 563
South Dakota	----------	142, 065	----------	----------	--------	--------	------------	142, 065
Tennessee	----------	----------	39, 958	----------	--------	--------	------------	39, 958
Texas	----------	----------	----------	2, 454	--------	--------	------------	2, 454
Utah	----------	721, 350	3, 312, 949	189, 405	5, 782	4, 648	2, 849, 674	7, 083, 808
Vermont	----------	----------	28, 205	----------	--------	--------	------------	28, 205
Washington	10	182, 754	385	48, 125	--------	1, 515	130, 867	363, 656
Wyoming	----------	----------	----------	----------	--------	--------	------------	----------
Total	77, 868	13, 938, 869	8, 310, 274	2, 159, 332	20, 178	418, 925	17, 533, 568	42, 459, 014

[1] Includes metal recovered from tungsten ore and furnace cleanup.
[2] Includes metal recovered from pyritic ore (residue).
[3] A little silver recovered from lead-copper ore from one mine included with that from lead ore.
[4] Includes metal recovered from tungsten ore.
[5] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[6] From magnetite-pyrite-chalcopyrite ore.

TABLE 15.—Gold and silver produced in the United States from ore and old tailings, in 1950, by States and by methods of recovery, in terms of recoverable metal [1]

State	Total ore, old tailings, etc. treated (short tons)	Ore and old tailings to mills						Crude ore to smelters		
		Short tons	Recoverable in bullion		Concentrates smelted and recoverable metal			Short tons	Gold (fine ounces)	Silver (fine ounces)
			Gold (fine ounces)	Silver (fine ounces)	Concentrates (short tons)	Gold (fine ounces)	Silver (fine ounces)			
Western States and Alaska:										
Alaska	58,668	58,668	9,993	1,011	664	2,168	13,112	-	-	-
Arizona	[2] 38,953,910	38,466,538	185	75	1,422,987	95,650	4,036,319	487,372	22,336	1,289,047
California	547,241	513,934	152,843	50,336	29,740	5,391	623,099	33,307	5,581	380,172
Colorado	1,372,744	1,330,705	29,577	13,648	159,203	71,836	2,713,963	42,039	9,564	760,928
Idaho	[3] 3,300,215	3,231,079	2,906	1,956	346,809	57,529	15,869,845	[3] 69,136	1,656	217,910
Montana	[4] 3,608,036	3,497,032	3,974	9,813	496,109	31,512	6,180,777	[4] 111,004	12,944	399,830
Nevada	[5] 7,745,119	7,649,250	74,271	347,296	261,388	63,371	853,323	95,869	4,427	326,798
New Mexico	7,899,054	7,791,669	90	35	325,082	2,259	248,984	107,385	1,059	89,562
Oregon	4,257	3,673	186	35	[6] 403	1,329	10,268	584	521	1,403
South Dakota	1,391,162	1,391,162	567,996	142,065	-	-	-	-	-	-
Texas	935	-	-	-	-	-	-	935	49	2,454
Utah	[7] 31,855,601	31,628,415	-	-	1,016,474	449,847	6,115,345	[7] 227,186	7,700	968,463
Washington	1,279,595	1,235,765	5,860	37,235	65,351	54,455	294,291	43,830	31,763	32,120
Wyoming	-	-	-	-	-	-	-	-	-	-
Total	98,016,537	96,797,890	847,881	603,505	4,124,210	835,347	36,959,326	1,218,647	97,600	4,468,687
States east of the Mississippi	[8] 9,199,137	[8] 9,199,093	20	-	656,990	2,070	113,355	44	-	-
Total	107,215,674	105,996,983	847,901	603,505	4,781,200	837,417	37,072,681	1,218,691	97,600	4,468,687

[1] Missouri excluded.
[2] Excludes 3,755,362 tons of ore leached from which no gold or silver was recovered.
[3] Includes 51,366 tons of old lead-smelter slag.
[4] Includes 20,764 tons of old lead-smelter slag fumed.
[5] Excludes tungsten ore.
[6] Includes 40 tons of concentrate from ore milled in 1949.
[7] Includes 3,843 tons of old slag smelted and fumed.
[8] Excludes magnetite-pyrite-chalcopyrite ore from Pennsylvania.

TABLE 16.—Gold and silver produced at amalgamation and cyanidation mills in the United States and percentage of gold and silver recoverable from all sources, 1941–45 (average) and 1946–50 [1]

Year	Bullion and precipitates recoverable (fine ounces)				Percent of gold and silver from all sources [1]							
	Amalgamation		Cyanidation		Amalgamation		Cyanidation		Smelting [2]		Placers	
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1941–45 (average)	373, 526	86, 812	402, 511	1, 750, 963	16. 2	0. 2	17. 5	3. 9	40. 6	95. 7	25. 7	0. 2
1946	278, 293	54, 255	229, 040	223, 926	17. 7	. 3	14. 5	1. 0	30. 3	98. 4	37. 5	. 3
1947	378, 578	80, 756	272, 039	273, 646	17. 9	. 2	12. 9	. 8	37. 0	98. 8	32. 2	. 2
1948	378, 590	104, 598	278, 237	481, 406	18. 8	. 3	13. 8	1. 3	37. 6	98. 2	29. 8	. 2
1949	450, 618	119, 443	290, 938	555, 859	22. 6	. 3	14. 6	1. 6	36. 0	97. 9	26. 8	. 2
1950	547, 118	153, 806	300, 783	449, 699	22. 9	. 4	12. 6	1. 0	39. 0	98. 4	25. 5	. 2

[1] Illinois, Michigan, and Missouri excluded, 1940–46; Missouri excluded, 1947–50.
[2] Both crude ores and concentrates.

TABLE 17.—Gold and silver produced at amalgamation and cyanidation mills in the United States in 1950, by States

State	Amalgamation		Cyanidation		Percent of gold and silver from all sources in State			
	Bullion recoverable (fine ounces)		Bullion and precipitates recoverable (fine ounces)		Amalgamation		Cyanidation	
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
Western States and Alaska:								
Alaska	9, 993	1, 011	-------	-------	3. 45	1. 92	-------	-------
Arizona	185	75	-------	-------	. 16	(1)	-------	-------
California	107, 786	18, 670	45, 057	31, 666	26. 15	1. 74	10. 93	2. 95
Colorado	29, 577	13, 648	-------	-------	22. 68	. 39	-------	-------
Idaho	2, 647	1, 946	259	10	3. 32	. 01	. 33	(1)
Montana	2, 003	4, 093	1, 971	5, 720	3. 87	. 06	3. 81	. 09
Nevada	5, 083	3, 182	69, 188	344, 114	2. 85	. 21	38. 77	22. 39
New Mexico	90	35	-------	-------	2. 64	. 01	-------	-------
Oregon	181	34	5	1	1. 64	. 25	. 05	. 01
South Dakota	389, 473	111, 080	178, 523	30, 985	68. 57	78. 19	31. 43	21. 81
Washington	80	32	5, 780	37, 203	. 09	. 06	6. 27	10. 23
Wyoming	-------	-------	-------	-------	-------	-------	-------	-------
Total	547, 098	153, 806	300, 783	449, 699	22. 87	. 36	12. 56	1. 06
tates east of the Mississippi	20	-------	-------	-------	. 96	-------	-------	-------
Grand total	547, 118	153, 806	300, 783	449, 699	22. 85	. 36	12. 56	1. 06

[1]Less than 0.01 percent.

PLACERS

Over one-fourth of the gold produced in 1950 was derived from placer mines. Of the 611,413 ounces of placer gold, 492,939 ounces (81 percent) was recovered by bucket-line dredges. Although this dredge output was over four times that of 1944, the wartime low, it was far below the all-time high of 904,149 ounces established in 1940.

The quantity of gold recovered by bucket-line dredges from the inception of the industry as a commercial factor in 1896 to the end of 1950 is recorded as 21,819,001 ounces, originating by States as follows: California, 13,010,175 ounces; Alaska, 6,106,444 (including the production from single-dipper dredges and some gold by hydraulicking); Montana, 785,419; Idaho, 684,176; and other States, 1,232,787.

TABLE 18.—Gold production at placer mines in the United States, by class of mine and method of recovery, 1946–50 [1]

Class and method	Mines producing	Washing plants (dredges)	Material treated (cubic yards)	Gold recoverable: Fine ounces	Gold recoverable: Value	Gold recoverable: Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucket-line dredges:						
1946	59	75	108,197,919	470,693	$16,474,255	$0.152
1947	60	79	120,362,326	514,931	18,022,585	.150
1948	57	78	120,062,532	475,228	16,632,980	.139
1949	52	74	110,897,581	425,863	14,905,205	.134
1950	43	63	108,250,189	492,939	17,252,865	.159
Dragline dredges:						
1946	65	64	7,506,360	38,351	1,342,285	.179
1947	71	65	10,325,994	55,448	1,940,680	.188
1948	42	41	5,224,260	31,446	1,100,610	.211
1949	35	31	4,583,055	22,789	797,615	.174
1950	23	21	4,623,474	21,032	736,120	.159
Becker-Hopkins dredges:						
1946	1	1	5,000	32	1,120	.224
1947–50						
Suction dredges:						
1946	3	3	37,900	267	9,345	.247
1947	12	10	79,590	588	20,580	.259
1948	8	9	84,200	473	16,555	.197
1949	12	13	278,765	1,418	49,630	.178
1950	17	14	263,800	1,422	49,770	.189
Nonfloating washing plants:						
1946	93	93	3,479,600	42,796	1,497,860	.430
1947	137	136	4,281,440	57,356	2,007,460	.469
1948	153	152	5,985,070	65,856	2,304,960	.385
1949	183	183	4,995,465	70,974	2,484,090	.497
1950	185	183	8,510,139	85,932	3,007,620	.353
Gravel hydraulically handled:						
1946	157		2,724,350	32,278	1,129,730	.415
1947	167		2,838,440	38,722	1,355,270	.477
1948	137		1,708,650	16,976	594,160	.348
1949	81		779,800	7,107	248,745	.319
1950	88		639,585	4,342	151,970	.238
Small-scale hand methods:						
Wet:						
1946	268		681,630	5,567	194,845	.286
1947	284		783,852	11,122	389,270	.497
1948	275		296,776	9,800	343,000	1.156
1949	279		248,076	4,234	148,190	.597
1950	250		261,562	4,856	169,960	.650
Dry:						
1946	17		7,400	262	9,170	1.239
1947	19		2,800	161	5,635	2.013
1948	10		3,900	170	5,950	1.526
1949	13		2,870	144	5,040	1.756
1950	7		2,200	88	3,080	1.400
Underground placers (drift):						
1946	26		12,407	358	12,530	1.010
1947	28		7,248	517	18,095	2.497
1948	42		20,105	551	19,285	.959
1949	26		3,717	206	7,210	1.940
1950	34		12,790	802	28,070	2.195
Grand total placers:						
1946	689		122,652,566	590,604	20,671,140	.169
1947	778		138,681,690	678,845	23,759,575	.171
1948	724		133,385,493	600,500	21,017,500	.158
1949	[2] 680		121,789,329	532,735	18,645,725	.153
1950	647		122,563,739	611,413	21,399,455	.175

[1] Data for 1948–49 revised owing to reclassification of 1 mine based on additional information received; grand totals are unchanged.

[2] A mine using more than 1 method of recovery is counted but once in arriving at total for all methods.

The second most important source of placer gold was nonfloating washing plants, with mechanical earth-moving equipment for gravel delivery. Production by this method has increased without interruption since 1944. Dragline dredging, a method that had risen phenomenally from 1933 to World War II, remained in third place in 1950. Production by hydraulicking, which has declined steadily since 1947, was surpassed by production by small-scale hand methods in 1950.

Alaska produced 45 percent of the United States placer gold in 1950, and California 41 percent. Other large producers, in order of importance, were Nevada, Colorado, Idaho, and Oregon. California was the leader in all but three methods of placer-gold production in 1950. Alaska led in nonfloating-washing-plant and hydraulic production, and Nevada in dry placering.

Table 18 shows the placer gold produced in the United States, classified by mining methods, in 1946–50.

Additional information on placer mining may be found in the State reviews of this volume.

REFINERY PRODUCTION

Table 19 contains official estimates of production of gold and silver in the United States, made by the Bureau of the Mint, based upon arrivals at United States mints and assay offices and at privately owned refineries. The mints and assay offices determine the State source of all newly mined unrefined material when deposits are received. The State source of material received by privately owned refineries is determined from information submitted by them and by intervening smelters, mills, etc., involved in the reduction processes.

TABLE 19.—Gold and silver refined in the United States, 1946–50, and approximate distribution of source, by States, in 1950, in fine ounces

[U. S. Bureau of the Mint]

State or Territory	Gold	Silver
1946	1,462,354	21,103,269
1947	2,165,318	38,587,069
1948	2,025,480	39,228,468
1949	1,921,949	34,944,554
1950:		
Alaska	275,529	50,471
Arizona	110,733	5,089,067
California	409,776	1,000,315
Colorado	124,053	3,342,669
Idaho	69,336	15,993,035
Illinois	----------	6,882
Michigan	----------	420
Missouri	----------	233,166
Montana	56,786	7,177,665
Nevada	169,576	1,634,222
New Mexico	6,574	365,007
New York	----------	33,288
Oregon	10,361	11,944
Pennsylvania	2,051	10,527
South Dakota	571,834	142,863
Tennessee	106	26,139
Texas	55	3,553
Utah	392,289	6,798,701
Vermont	140	27,861
Virginia	----------	177
Washington	89,413	357,918
Wyoming	96	2,849
Total	2,288,708	42,308,739

CONSUMPTION AND USES IN INDUSTRY AND THE ARTS

Monetary use has claimed by far the largest part of the gold and silver output through the years, but this use to a large extent takes the form of stockpiling in Government and private hoards that can be made available to industry and the arts without smelter or refinery preparation. In contrast, the gold and silver that enter industry and the arts are consumed much as are other metals, any return as secondary metal requiring the usual channels of collection, smelting, and refining. The consumption of gold and silver in the arts antedates written history, but industrial use of these two metals is a comparatively recent development.

TABLE 20.—Gold and silver produced in the United States, 1792–1950 [1]

Period	Gold		Silver	
	Fine ounces	Value [2]	Fine ounces	Value [3]
1792–1847	1, 187, 170	$24, 537, 000	309, 500	$404, 500
1848–73	60, 021, 278	1, 240, 750, 000	146, 218, 600	193, 631, 500
1874–1950	223, 167, 997	5, 408, 419, 670	3, 920, 658, 673	2, 953, 877, 316
Total	284, 376, 445	6, 673, 706, 670	4, 067, 186, 773	3, 147, 913, 316

[1] From Report of the Director of the Mint. The estimates for 1792–1873 are by R. W. Raymond, Commissioner of Mining Statistics, Treasury Department, and since then, by the Director of the Mint.
[2] Gold valued in 1934 and thereafter at $35 per fine ounce; prior thereto, at $20.67+ per fine ounce.
[3] Silver valued in 1934 and thereafter at Government's average buying price for domestic product.

Gold.—The arts require a much larger quantity of gold than does industry, but the metal's corrosion resistance and other properties have resulted in some industrial demand. Consumption in the arts increased rapidly during the war. A high marriage rate and widespread prosperity have increased the sale of jewelry, watches, and many luxury items made of gold. Comparison of 1950 gold figures with those for 1949 shows an 8-percent decrease in the return from industrial use, a 10-percent decrease in issue for industrial use, and a 10-percent decrease in net consumption. The net absorption by industry and the arts exceeded the total new gold produced from domestic mines during 1950 by 17 percent.

TABLE 21.—Net industrial consumption of gold and silver in the United States, 1941–45 (average) and 1946–50

[U. S. Bureau of the Mint]

Year	Gold (dollars)			Silver (fine ounces)		
	Returned from industrial use	Issued for industrial use	Net industrial consumption	Returned from industrial use	Issued for industrial use	Net industrial consumption
1941–45 (average)	25, 323, 004	100, 699, 484	75, 376, 480	41, 808, 965	149, 455, 167	107, 646, 202
1946	45, 999, 837	199, 686, 837	153, 687, 000	36, 646, 860	123, 646, 860	87, 000, 000
1947	49, 229, 578	98, 129, 578	48, 900, 000	27, 866, 359	126, 366, 359	98, 500, 000
1948	45, 142, 764	90, 128, 764	44, 986, 000	23, 897, 173	129, 186, 173	105, 289, 000
1949	40, 133, 100	148, 975, 571	108, 842, 471	22, 660, 459	110, 660, 459	88, 000, 000
1950	36, 742, 020	134, 587, 773	97, 845, 753	45, 257, 340	155, 257, 340	110, 000, 000

Silver.—The 1950 consumption of silver in industry and the arts was the largest since 1945. Consumption was high in relation to prewar totals and exceeded any annual output ever achieved by domestic mines.

Widespread prosperity and a high marriage rate sustained postwar demand for sterling and plated silverware, jewelry, watch cases, church articles, pens, pencils, and other items largely in the luxury class. Consumption was large in photography, particularly for motion pictures. The industrial uses of silver had grown greatly during the war and continued to absorb much silver thereafter, although on a reduced scale.

MONETARY STOCKS

Gold holdings of the United States declined $1,721,000,000 (7 percent) from $24,427,000,000 on December 31, 1949, to $22,706,000,000 on December 31, 1950, according to the Federal Reserve Bulletin. Total world reserves are not positively known, inasmuch as data are not available for some countries, including Germany, Japan, Australia, and U. S. S. R. Currency-stabilization funds secretly held add to the difficulties in reaching an approximation. However, the Federal Reserve estimates that the total world reserves of gold on January 1, 1951, amounted to $35,820,000,000, exclusive of holdings of the U. S. S. R.

Foreign gold reserves increased rapidly after the United States entered the war late in 1941, largely because United States war purchases abroad so greatly exceeded commercial exports in value. During the war period foreign reserves increased nearly $5,000,000,000, and United States reserves decreased over $2,500,000,000. Sharing prominently in the increase were Switzerland, Sweden, Turkey, Iran, Spain, Union of South Africa, and Latin-American countries. In 1946, however, there was a reversal in the direction of the flow of gold, and United States reserves increased steadily through 1949, with a gain of about $4,400,000,000. The decline in United States stocks in 1950 substantially exceeded the world mine output.

United States Treasury silver holdings increased 5,000,000 fine ounces during 1950 to 1,983,000,000 ounces. The holdings do not include 410,553,011 ounces released under lend-lease agreements that provide for return of the silver.

PRICES

Since January 1934 the price of gold at the United States Mint has been $35 per fine troy ounce. The Treasury buying price for silver domestically mined after July 1, 1939, was fixed at $0.711+ per ounce on July 6, 1939; on July 31, 1946, the President approved an act (Public Law 579, 79th Cong.) which provided that the seigniorage to be deducted for silver mined after July 1, 1946, and delivered to the Treasury be reduced from 45 percent to 30 percent. The effect was to raise the price of domestically mined silver to 90.50505+ cents an ounce; there has been no price change since.

The average price of pound-sterling exchange in New York (buying rates for cable transfers, as certified by the Federal Reserve Bank of New York) was: January 1948–August 1949, $4.03; September 1949, $3.44; October–December 1949, $2.80). The London price of silver, per ounce, 0.999 fine, as reported by the Director of the Mint, opened in 1948 at 45d., a level maintained past midyear, when after a short upward movement it fell to 42.5d. by the year end. Changes in 1949 were of little significance until devaluation of the pound in September, following which the price rose to 64d., where it remained the rest of the year. Prices in 1950 ranged from a low of 63d. to a high of 70d. (equivalent, in United States currency, to $0.73518 to $0.81687). The New York price, per ounce, 0.999 fine, opened in 1950 at $0.7325, where it held until two small drops late in March placed it at $0.7175. It recovered to $0.7275 early in May and continued at this level to late in October. Two sharp rises then brought the price to $0.8000, where it remained the balance of the year.

FOREIGN TRADE [1]

The excess of gold imports over exports that has prevailed since 1946 was replaced in 1950 by an excess of exports over imports. The loss to monetary stocks from excess exports plus consumption in arts and industries greatly exceeded the output from domestic mines, so that monetary gold stocks decreased. The excess of silver imports over exports was 107 percent greater in 1950 than in 1949. Excess imports plus domestic production exceeded domestic consumption, with the result that silver holdings increased.

TABLE 22.—Value of gold and silver imported into and exported from the United States, 1946–50

[U. S. Department of Commerce]

	Imports	Exports	Excess of imports over exports [1]
Gold:			
1946	$532,961,768	$221,467,636	$311,494,132
1947	2,079,588,406	213,240,800	1,866,347,606
1948	1,981,175,178	300,771,144	1,680,404,034
1949	771,390,261	84,935,678	686,454,583
1950	162,748,661	534,035,794	−371,287,133
Silver:			
1946	57,577,888	36,454,690	21,123,198
1947	68,140,343	30,648,742	37,491,601
1948	70,884,513	12,400,060	58,484,453
1949	73,535,694	23,281,043	50,254,651
1950	110,035,107	6,201,874	103,833,233

[1] Excess of exports over imports indicated by minus sign.

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 23.—Gold imported into the United States in 1950, by countries of origin

[U. S. Department of Commerce]

Country of origin	Ore and base bullion		Bullion, refined		United States coin (value)	Foreign coin (value)
	Troy ounces	Value	Troy ounces	Value		
Australia	18,299	$639,710				
Belgium-Luxembourg	1,924	67,332				
Bolivia	970	33,901				
Brazil	644	22,436				$70
British Guiana	12,590	440,419				
British Western Pacific Islands	92,171	3,223,809				
Canada	183,199	6,403,964	280,933	$9,832,665		2,013
Chile	40,415	1,406,613				
Colombia	572	19,974				
Costa Rica	115	4,003				
Cuba	6,915	241,649				
Dominican Republic	475	16,604				
Ecuador	96,376	3,372,491				
El Salvador	23,913	836,707				
Finland	799	27,898				
France	8,077	282,684				260
Germany	253	8,859			$2,000	20
Guatemala	397	13,826				
Honduras	19,793	692,728				
Italy	876	30,622				
Japan	2,536	88,584	1,272,294	44,530,271		
Liberia	12,257	425,681				
Malta, Gozo, and Cyprus	2,604	90,897				
Mexico	103,626	3,606,965				
Nicaragua	125,594	4,389,354				
Northern Rhodesia	691	24,156				
Panama	1,214	42,318	72	2,500		
Peru	19,373	675,937	772	27,020		
Philippines	85,996	3,003,385	1,994	69,796		
Portugal	17,704	619,611				
Saudi Arabia	7,568	264,727				
Southern Rhodesia	2,099	73,445				
Spain			601,631	21,057,075		
Taiwan			51,091	1,788,169		
Turkey	1,296	45,372				
Union of South Africa	754	26,352	629,248	22,023,696		
United Kingdom	457	16,008	907,643	31,767,343		424
Venezuela	183	6,380				
Yugoslavia	13,129	459,243				
Other countries	19	685			10	
Total	905,873	31,645,329	3,745,678	131,098,535	2,010	2,787

TABLE 24.—Gold exported from the United States in 1950, by countries of destination

[U. S. Department of Commerce]

Country of destination	Ore and base bullion		Bullion, refined		Foreign coin (value)
	Troy ounces	Value	Troy ounces	Value	
Austria			336	$12,000	
Belgium-Luxembourg			267	10,973	
Brazil			1,957	82,270	
Canada			12,150,010	425,250,437	
Chile			3,263	122,141	
Costa Rica			71	2,498	
Cuba			3,093	113,724	
Denmark			303	11,333	
Dominican Republic			202	8,862	
Egypt			1,265,675	44,213,374	
El Salvador			9,664	339,553	
France			9,282	332,952	
French Indochina			4,042	150,817	
Germany			72,146	2,554,914	
Greece					$16,456,174
Haiti			92	3,635	
Hong Kong			23	1,172	
Iran			5,218	191,093	
Israel			28	1,048	
Kuwait			167,332	6,382,485	
Lebanon			14,954	565,698	
Mexico			106	4,042	
Netherlands			2,864	107,640	
Netherlands Antilles			75	4,044	
Panama			1,592	58,461	
Paraguay			24	1,166	
Peru			344,147	12,045,111	
Philippines			67,614	3,371,372	
Poland-Danzig			85,974	3,009,096	
Portugal			67,665	2,448,972	
Portuguese Asia			76,929	2,887,998	
Saudi Arabia					3,296,177
Switzerland			7,210	295,497	
Syria			61,201	2,142,036	
Taiwan (Formosa)			100,001	3,500,054	
Tangier			38,413	1,442,372	
Turkey			2,996	104,624	
United Kingdom	725	$34,000			
Uruguay			8,371	316,571	
Venezuela			47,711	1,727,538	
Yugoslavia			12,303	430,755	
Other countries			24	1,115	
Total	725	34,000	14,633,178	514,249,443	19,752,351

TABLE 25.—Silver imported into the United States in 1950, by countries of origin

[U. S. Department of Commerce]

Country of origin	Ore and base bullion		Bullion, refined		United States coin (value)	Foreign coin (value)
	Troy ounces	Value	Troy ounces	Value		
Argentina	7,495	$5,452				
Australia	1,601,986	1,143,330				
Bahamas					$3,150	
Belgium-Luxembourg	686,571	480,498	246,760	$175,313		
Bermuda					18,100	
Bolivia	4,961,317	3,580,268				
Brazil	17,050	12,210				
British Western Pacific Islands	26,439	18,972				
Canada	3,912,130	2,839,906	10,075,878	7,632,282	1,586,595	$513
Chile	2,001,947	1,432,388	46,441	34,969		
China	556,449	390,796	2,086,102	1,478,881		736,680
Colombia	13,533	9,578				
Costa Rica	215	151			6,000	
Cuba	221,779	158,845			1,346,000	15,465,330
Denmark			604,683	430,688		
Dominican Republic					6,449	
Ecuador	348,046	244,989				
El Salvador	555,250	394,407				
Finland	3,505	2,550				
France	224,998	158,681	50,236	36,140	7,700	121,173
French Somaliland						
Germany	37,262	26,360			8,820	
Guatemala	54,209	39,016				
Honduras	3,311,228	2,448,712			625,000	
Hong Kong	777,446	549,364	601,144	411,311		1,120,163
Iceland	3,671	2,650				
Italy	52,692	39,727	160,743	113,698		
Japan	2,572	1,800	3,578,610	2,549,548		215
Lebanon	7,371	5,160			3,044	4,902
Malta, Gozo, and Cyprus	25,534	17,874				
Mexico	6,083,025	4,418,988	42,212,691	31,574,543	42,800	147
Netherlands	960,531	692,996	4,316,696	3,106,675	110	
Nicaragua	133,282	97,325			5,483	
Northern Rhodesia	197,139	144,190				
Panama	1,472	1,031				
Peru	5,128,034	3,698,625	5,167,804	3,839,748		210,904
Philippines	316,071	226,230				
Portugal	68,017	48,371				
Saudi Arabia	26,037	19,699				219,676
Southern Rhodesia	7,138	5,046				
Spain						7,180,543
Switzerland	203,735	145,363	383,970	274,014		
Syria			7,701	5,390		
Turkey	14,226	10,208				
Union of South Africa	503,102	376,279				
U. S. S. R.					1,200	
United Kingdom	153,103	107,227	3,079,203	2,240,295	21,100	200
Venezuela	292	210	687,785	496,958		120
Yugoslavia	690,363	496,778	843,667	578,418		1,820,107
Other countries	2,535	1,762				
Total	33,898,797	24,494,012	74,150,114	54,978,871	3,681,551	26,880,673

TABLE 26.—Silver exported from the United States in 1950, by countries of destination

[U. S. Department of Commerce]

Country of destination	Bullion, refined		United States coin (value)	Foreign coin (value)
	Troy ounces	Value		
Australia				$1,700
Brazil	2,642	$2,109		
Canada	978,095	782,686		633,986
Colombia	200,874	150,298		
Cuba	2,521	1,942		
El Salvador			$50,000	14,444
France	717,311	571,468		
Germany	2,027,446	1,555,523		
Honduras				2,673
Mexico				1,933,160
Netherlands	27,747	20,415		
New Zealand				1,555
Norway	31,998	23,800		
Saudi Arabia			1,000	
Switzerland	301,388	226,117		
United Kingdom	298,755	220,989		
Uruguay	5,365	4,052		
Venezuela	3,506	2,690		
Other countries	637	517	750	
Total	4,598,285	3,562,606	51,750	2,587,518

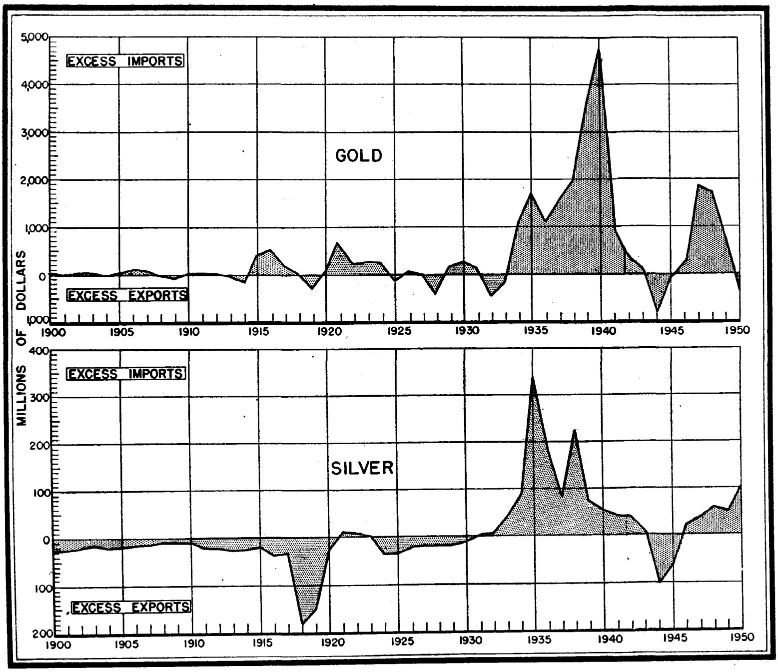

FIGURE 3.—Net imports or exports of gold and silver, 1900–50.

TECHNOLOGY

During 1948 and 1949 research studies were made at the Rare and Precious Metals Experiment Station of the Bureau of Mines, Reno, Nev., to improve procedures for recovering gold adsorbed by activated carbon from cyanide solution and pulp. A commercially feasible method was developed that accomplished this objective by leaching the gold-laden carbon with caustic sodium sulfide solution, followed by electrolysis. Advantages are economy, conservation of carbon for re-use, and production of high-purity gold bullion.[2]

WORLD REVIEW

World gold output rose slightly in 1950, continuing the movement since 1946, but the 1950 total remained considerably below annual quantities produced before World War II. World silver output rose 10 percent in 1950 over 1949, owing mostly to gains in the United States, Canada, and Peru.

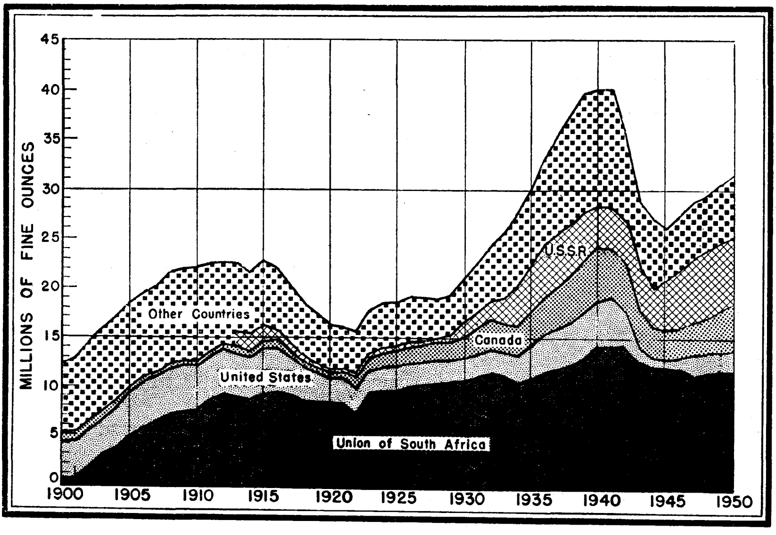

FIGURE 4.—World production of gold, 1900–50.

[2] Zadra, J. B., A Process for the Recovery of Gold from Activated Carbon by Leaching and Electrolysis: Bureau of Mines Report of Investigations 4672, 1950, 47 pp.

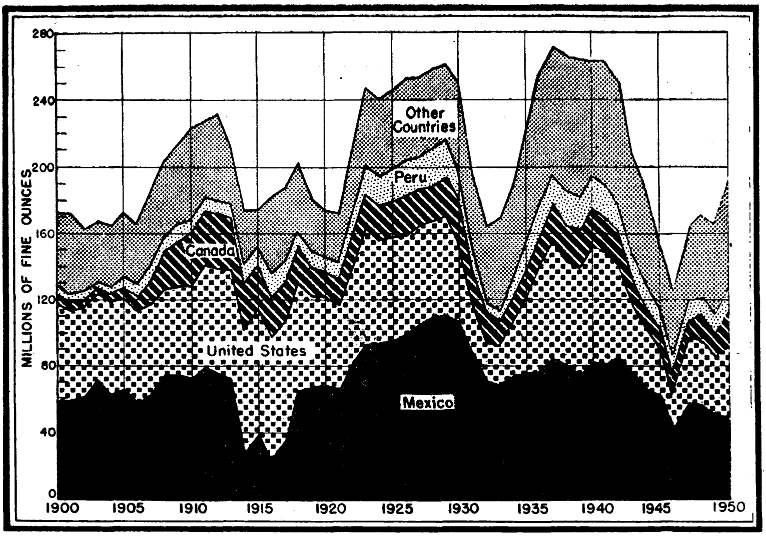

FIGURE 5.—World production of silver, 1900–50.

TABLE 27.—World production of gold, 1945–50, by countries, in fine ounces [1]

[Compiled by Berenice B. Mitchell and Pauline Roberts]

Country	1945	1946	1947	1948	1949	1950
North America:						
United States (including Alaska) [2]	915,403	1,462,354	2,165,318	2,025,480	1,921,949	2,288,708
Canada	2,696,727	2,832,554	3,070,221	3,529,608	4,123,518	4,430,612
Newfoundland	11,767	12,854	11,032			
Central America and West Indies:						
Costa Rica [3]	3,054	1,251	1,988	1,096	284	115
Cuba	[3] 423	1,105	364	334	[3] 5,692	[3] 6,915
Dominican Republic [3]	486	645	16	29	993	475
Guatemala [3]	66	36	35	16	5	397
Haiti	[3] 73	41				
Honduras	17,078	12,833	12,037	13,633	25,832	36,545
Nicaragua (exports)	206,360	203,390	213,454	222,627	219,139	229,206
Panama				1,000	[4] 9,657	1,118
Salvador (exports)	16,526	21,798	10,755	20,778	27,091	29,053
Mexico	499,301	420,500	464,739	367,612	405,550	408,122
Total	4,367,200	4,969,400	5,950,000	6,182,200	6,739,700	7,431,300
South America:						
Argentina	3,381	8,038	[5] 8,000	[5] 8,000	[5] 8,000	[6]
Bolivia	5,888	16,700	20,108	6,687	33,533	[4] 1,737
Brazil (estimate)	212,200	175,000	167,000	156,900	183,500	180,000
British Guiana	22,533	19,793	21,111	16,518	19,368	11,800
Chile	180,462	230,880	168,855	164,258	179,144	206,858
Colombia	506,695	437,176	383,027	335,260	359,474	379,412
Ecuador	68,038	75,254	57,250	79,207	99,241	91,946
French Guiana	20,641	19,741	14,918	13,625	14,265	12,249
Peru	172,661	158,378	116,016	111,162	137,959	128,603
Surinam	5,895	4,648	4,134	4,177	3,794	4,546
Uruguay	[5] 1,000					
Venezuela	76,839	48,558	21,830	49,730	61,378	34,462
Total	1,276,000	1,194,000	982,000	946,000	1,100,000	1,060,000
Europe:						
Czechoslovakia	1,529	1,903	2,090	[6]	[6]	[6]
Finland	6,633	7,327	11,285	11,317	14,587	9,465
France	39,738	48,355	42,407	47,519	47,294	63,015
Hungary	193	1,318	1,993	[6]	[6]	[6]
Italy	1,768	8,520	11,253	18,422	10,385	10,674

For footnotes, see end of table.

TABLE 27.—World production of gold, 1945–50, by countries, in fine ounces [1]—Continued

Country	1945	1946	1947	1948	1949	1950
Europe—Continued						
Portugal	----------	6,687	15,754	11,799	10,385	([6])
Rumania	90,987	80,377	74,686	90,000	112,528	([6])
Spain	2,025	3,729	2,714	11,375	30,318	13,217
Sweden	85,585	91,372	75,586	71,889	80,280	([6])
U. S. S. R. (estimate) [7]	5,000,000	6,000,000	7,000,000	7,000,000	7,000,000	7,000,000
Total	5,200,000	6,300,000	7,200,000	7,300,000	7,400,000	7,400,000
Asia:						
Burma	30	2	9	230	158	([6])
China	----------	----------	107,535	88,200	[5] 60,000	[5] 160,000
Formosa	579	424	8,387	17,668	16,607	18,232
India	168,366	131,775	171,704	180,490	163,871	196,848
Indonesia [5]	----------	16,000	16,000	32,000	32,000	([6])
Japan	128,410	43,154	55,029	69,060	84,492	132,332
Korea:						
North	96,452	192,000	322,000	([6])	([6])	([6])
South		1,269	2,494	3,466	3,419	([6])
Malaya	287	445	5,312	10,212	13,617	18,436
Philippines	[8] 13,490	360	64,441	209,225	287,844	333,991
Sarawak	([6])	17	389	599	1,523	1,440
Saudi Arabia	37,972	48,000	52,000	74,000	66,835	66,202
U. S. S. R.	([7])	([7])	([7])	([7])	([7])	([7])
Total	446,000	433,000	805,000	791,000	786,000	984,000
Africa:						
Angola	822	552	360	443	319	201
Bechuanaland	11,297	9,739	7,381	1,507	256	261
Belgian Congo [9]	346,971	331,313	301,445	299,774	333,853	339,415
Egypt	3,014	2,793	2,090	3,853	7,045	9,242
Eritrea	2,119	3,411	3,674	2,242	2,243	1,042
Ethiopia	[4] 56,176	[4] 51,528	[4] 27,382	41,595	45,102	[5] 43,200
French Cameroon	16,300	11,927	11,510	10,706	8,938	7,170
French Equatorial Africa	76,069	71,535	64,044	63,723	57,260	54,996
French Guinea	([6])	4,405	7,395	88,029	([6])	([6])
French Morocco	161	482	1,029	804	643	119
French West Africa	6,945	7,009	5,564	20,512	46,381	96,452
Gold Coast	539,252	585,910	558,011	672,388	676,934	[5] 680,000
Kenya	38,517	29,892	21,959	23,429	20,072	22,945
Liberia	[4] 9,016	16,506	16,987	13,797	14,656	11,025
Madagascar	6,430	3,890	1,511	2,095	1,663	1,935
Mozambique	7,897	5,766	5,427	4,734	2,468	([6])
Nigeria	8,108	4,881	2,203	2,899	2,515	2,238
Northern Rhodesia	265	[10] 6,838	[10] 779	[10] 1,180	[10] 1,186	[10] 1,432
Sierra Leone	274	183	2,400	2,193	2,160	3,523
Southern Rhodesia	568,241	544,596	522,735	514,440	528,180	511,163
South-West Africa	83	67	34	455	32	32
Sudan	1,623	3,670	3,725	3,579	4,114	3,503
Swaziland	3,583	4,914	5,637	3,110	2,841	1,794
Tanganyika (exports)	49,302	48,428	47,317	57,557	68,989	65,127
Uganda (exports)	2,295	2,176	1,366	1,158	650	590
Union of South Africa	12,224,629	11,927,165	11,200,281	11,584,849	11,705,048	11,663,713
Total	13,980,000	13,679,000	12,822,000	13,421,000	13,614,000	13,585,000
Oceania:						
Australia:						
Commonwealth	657,212	824,480	937,654	885,507	889,057	850,000
New Guinea	----------	661	59,202	86,556	93,045	[5] 75,000
Fiji	94,964	82,402	94,353	93,059	104,036	103,421
New Zealand	128,364	119,271	112,260	93,903	84,874	76,527
Total	880,540	1,026,814	1,203,469	1,159,025	1,171,012	1,104,948
World total (estimate) [1]	26,100,000	27,600,000	28,900,000	29,800,000	30,800,000	31,600,000

[1] Figures used derived in part from American Bureau of Metal Statistics. For some countries accurate figures are not possible to obtain owing to clandestine trade in gold. Data not available for Austria, Bulgaria, Germany, Norway, Thailand, and Yugoslavia; estimates included in the total. In addition, production in Cyprus, Indochina, and Papua was negligible.
[2] Refinery production. Excludes production of the Philippines.
[3] Imports into United States.
[4] Exports.
[5] Estimate.
[6] Data not available; estimate included in total.
[7] Output from U. S. S. R. in Asia included with U. S. S. R. in Europe.
[8] Figure published by Director of the Mint, representing gold of Philippine origin refined but not necessarily mined during the year.
[9] Includes Ruanda-Urundi.
[10] Included is yield from Nkana mine refinery slimes accumulated during the war: 6,594 ounces in 1946, 547 in 1947, 999 in 1948, 972 in 1949, and 1,296 in 1950.

TABLE 28.—World production of silver, 1945–50, by countries, in fine ounces [1]

[Compiled by Berenice B. Mitchell and Pauline Roberts]

Country	1945	1946	1947	1948	1949	1950
North America:						
United States	29,046,047	21,103,269	38,587,069	39,228,468	34,944,554	42,308,739
Canada	12,942,906	12,544,100	12,504,018	}16,109,982	17,641,493	22,386,456
Newfoundland	1,076,129	1,107,827	956,052			
Central America and West Indies:						
Costa Rica [2]	1,380	604	1,470	3,029	720	215
Cuba	[2] 107,195	127,222	146,932	185,216	[2] 157,411	[2] 221,779
Guatemala	(3)	(3)	(3)	(3)	81,502	339,360
Honduras	3,003,495	2,682,910	2,413,399	3,170,871	3,431,614	[4] 4,049,247
Nicaragua	[4] 240,197	[4] 260,637	[4] 213,417	[2] 216,802	[2] 191,082	[2] 133,282
Salvador	[4] 223,705	[4] 313,180	[4] 265,104	[4] 216,342	280,309	462,973
Mexico	61,097,727	43,263,132	58,843,863	57,519,703	49,454,882	49,141,445
Total	107,739,000	81,403,000	113,931,000	116,650,000	106,184,000	119,043,000
South America:						
Argentina [5]	2,760,000	3,090,000	2,435,400	1,201,900	1,249,421	1,150,000
Bolivia (exports)	6,683,561	6,106,165	6,233,354	7,562,208	6,634,627	6,566,950
Brazil	28,385	21,968	20,293	23,095	21,041	[5] 12,860
Chile	825,438	557,333	747,055	861,961	799,685	746,797
Colombia	168,699	151,971	110,352	109,188	106,590	115,711
Ecuador	235,500	192,200	134,100	205,800	276,900	275,526
Peru	12,997,845	12,334,249	10,782,995	9,288,777	10,627,717	13,053,201
Total	23,699,000	22,454,000	20,464,000	19,253,000	19,716,000	21,921,000
Europe:						
Austria	-----	-----	-----	(3)	12,890	18,901
Czechoslovakia [5]	300,000	600,000	1,400,000	1,600,000	(3)	(3)
Finland	45,236	146,929	188,821	167,615	171,150	115,939
France	350,025	535,213	474,320	494,414	570,888	549,669
Germany (Federal Republic)	(3)	(3)	(3)	[6] 867,459	1,601,782	(3)
Hungary	[7] 3,200	14,854	(3)	(3)	(3)	(3)
Italy	1,382	313,791	443,680	595,432	793,545	851,995
Norway	131,818	202,550	228,270	215,410	170,399	[5] 150,000
Portugal	-----	-----	7,395	35,366	31,958	(3)
Rumania	189,689	(3)	481,264	(3)	(3)	(3)
Spain	497,661	669,009	638,192	339,396	514,283	823,059
Sweden	1,135,178	1,294,935	1,088,656	1,137,943	1,140,708	1,291,656
United Kingdom	27,517	23,285	23,522	25,000	(3)	(3)
Total (estimate)	12,000,000	13,000,000	15,000,000	18,000,000	27,000,000	28,000,000
Asia:						
Burma	-----	-----	-----	415,099	(3)	(3)
China	(3)	(3)	1,747	(3)	160,000	320,000
India	14,154	9,821	12,422	12,797	11,275	15,676
Japan	4,293,121	1,281,625	1,792,050	2,185,672	2,887,265	3,680,617
Korea:						
North	-----	[5] 128,600	[5] 128,600	(3)	(3)	(3)
South	-----	27,572	38,689	38,505	18,932	(3)
Philippines	17,208	3,600	54,940	150,760	218,419	216,034
Saudi Arabia	24,144	31,307	49,805	67,819	81,295	124,287
Taiwan (Formosa)	3,156	108	1,856	7,042	4,836	2,098
Total (estimate)	4,500,000	1,500,000	2,200,000	3,000,000	3,600,000	4,600,000
Africa:						
Algeria	14,661	39,996	24,435	29,739	(3)	(3)
Bechuanaland	1,237	1,704	1,086	233	23	24
Belgian Congo	4,141,016	5,047,666	4,057,295	3,805,715	4,549,330	4,459,951
French Morocco	107,609	117,157	356,712	487,598	491,906	482,261
Gold Coast (exports)	36,666	54,525	41,250	45,553	38,887	43,317
Kenya	16,659	5,493	3,859	3,184	2,279	2,586
Mozambique	998	805	712	616	244	(3)
Nigeria	1,106	666	2,130	4,270	484	325
Northern Rhodesia	2,269	[8] 634,392	[8] 73,277	[8] 145,865	[8] 134,920	[8] 173,304
Southern Rhodesia	95,975	95,168	91,900	81,404	84,495	85,549
South-West Africa	-----	-----	[5] 390,000	323,647	642,500	843,737
Swaziland	163	-----	211	124	120	60
Tanganyika (exports)	21,377	21,096	20,794	25,010	27,631	31,014
Tunisia	34,369	60,122	53,852	16,011	156,638	(3)
Uganda (exports)	275	205	87	56	(3)	(3)
Union of South Africa	1,243,426	1,207,373	1,147,694	1,170,951	1,159,375	1,119,135
Total	5,718,000	7,287,000	6,266,000	6,140,000	7,310,000	7,400,000

For footnotes, see end of table.

TABLE 28.—World production of silver, 1945–50, by countries, in fine ounces [1]—Continued

[Compiled by Berenice B. Mitchell and Pauline Roberts]

Country	1945	1946	1947	1948	1949	1950
Oceania:						
Australia:						
Commonwealth	8,076,740	9,045,280	9,527,140	10,057,519	9,849,213	10,677,456
New Guinea			[9] 35,421	[9] 31,739	[9] 31,786	[3]
Fiji	29,398	26,351	33,237	29,187	29,755	37,736
New Zealand	244,544	224,341	221,984	232,563	232,599	199,701
Total	8,351,000	9,296,000	9,818,000	10,351,000	10,143,000	10,945,000
World total (estimate) [1]	162,000,000	135,000,000	167,700,000	173,400,000	174,000,000	192,000,000

[1] Silver is also produced in Bulgaria, Cyprus, Greece, Hong Kong, Federation of Malaya, Indonesia, Poland, Sarawak, Sierra Leone, Turkey, U. S. S. R., and Yugoslavia; production data are not available but estimates are included in total.
[2] Imports into the United States. Scrap is included in this figure in many instances, most notably in th case of Cuba.
[3] Data not available; estimate included in total.
[4] Exports.
[5] Estimate.
[6] American and British zones only.
[7] Data represent Trianon Hungary after October 1944.
[8] Recovered from an accumulation of refinery slimes.
[9] Fiscal year ended May 31 of year following that stated.

Australia.—In comparison with the preceding year, gold production in Australia declined 4 percent to 850,000 ounces in 1950. Devaluation of the Australian pound had the effect of increasing the pound value of the gold output of 1950 about 20 percent, but this incentive was offset by the adverse factors of inflation and shortages of labor and supplies. Silver production in 1950 rose 8 percent to 10,677,456 ounces.

Canada.—Canada ranks third among the gold-producing countries of the world, exceeded in output by only the Union of South Africa and (probably) the Soviet Union. Despite the handicaps of the fixed value of gold and rising costs of labor and supplies, gold production in Canada rose 7 percent in 1950, and once again gold was the leading mineral product in regard to value. Eighty-four percent of the gold output of 1950 was obtained by straight lode-gold mining, 3 percent by gold placer mining, and 13 percent as a byproduct of base-metal mining. The gold-mining industry was aided by the exchange value of the Canadian dollar in relation to the United States dollar, which resulted in an average price of gold of $38.04 per troy ounce in Canadian funds in 1950. Nonetheless, the year closed with many straight gold-mining companies seeking tax and other concessions and with the Government showing concern for the ability of some lower-grade mines to remain in business.

Output of gold in 1949 and 1950 was as follows, in fine troy ounces:

Province or Territory:	*1949*	*1950*
British Columbia	304,307	291,984
Manitoba and Saskatchewan	231,607	273,197
Northwest Territories	177,493	200,973
Ontario	2,354,509	2,457,208
Quebec	964,184	1,097,593
Yukon	81,970	100,755
Others [1]	9,448	8,902
Total	4,123,518	4,430,612

[1] Alberta, Nova Scotia, and Newfoundland.

Canada also ranks third in silver production in the world, following Mexico and the United States. The output of silver rose 27 percent in 1950, continuing an uptrend that started in 1948.

Exports of silver from Canada in 1950 comprised 8,355,183 ounces of refined silver and 3,494,107 ounces of silver in ores and concentrates, compared with 6,211,912 and 4,054,614 ounces, respectively, in 1949.

Colombia.—Gold production in Colombia increased 6 percent to 379,412 ounces in 1950, continuing an uptrend that started in 1949 after a steady decline that began in 1941. About two-thirds of the gold output of Colombia is produced from placer mines and the remainder from lode mines. Silver production in 1950 increased 9 percent to 115,711 ounces. The entire silver yield of Colombia is obtained as a byproduct of gold-mining operations.

Honduras.—Honduras ranks first among the countries of Central America and sixth among the countries of the Western Hemisphere in silver production. The principal producers are the San Juancito and El Mochito mines, operated by the New York & Honduras Rosario Mining Co. The former had an output of 2,337,782 ounces of silver and 16,182 of gold in 1950, and the latter 1,168,363 and 700 ounces, respectively. The New Idria Honduras Mining Co. continued to operate its low-grade San Andres gold mine throughout 1950, with a production of bullion and concentrates valued at 1,007,298 lempiras (about $500,000) from 81,757 dry tons of ore.

Japan.—Gold and silver have been produced in Japan for centuries and to some measure from every part of the country, according to a recent report. Areas of intense Tertiary volcanic activity in Hokkaido, northwest Honshu, Izu-hanto, and central and southwest Kyushu have contributed most of the output. Pyrite deposits in Paleozoic rocks in Shikoku are also important producers. The early gold output was largely from placer mining, but this method has greatly decreased in importance. Most of the recent production of gold and almost half the silver were obtained from gold-silver lode mining and the remainder as byproducts of base-metal mining. The reserve position is not favorable, but enough ore has been blocked out to support continued operations for some years. With economic conditions no worse than in March 1949, about 150,000 ounces of gold and 5,000,000 ounces of silver probably can be produced annually by 1953. The average annual production from 1925 to 1945 was about 400,000 ounces of gold and 6,600,000 ounces of silver.[3]

Mexico.—Mexico maintained its normal position as the leading silver producer of the world in 1950, followed by the United States in second place. Since October 21, 1948, silver exports, whether in coins or bars, have been subjected to the approval of the Bank of Mexico. According to Handy and Harman: [4]

> As the largest single source of silver available to world markets, Mexico continued to play a dominant role. In spite of the very substantial quantities shipped to New York from other countries, sellers here remained sensitive to the official policies of Mexico, and throughout the year these policies to a large extent had the effect of stabilizing and supporting the New York market. During the first six months of 1950, the Bank of Mexico was a buyer on balance. However, the exceptionally high rate of trade demand in the United States which developed

[3] Grant, Robt. Y., Gold and Silver in Japan: Bureau of Mines Mineral Trade Notes, Spec. Suppl. 34, September 1950, 112 pp.

[4] Handy and Harman, 35th Annual Review of the Silver Market: 1950, 24 pp.

during the last half of the year enabled Mexico to dispose of a large part of accumulated metal, so that on December 31st official stocks were about the same level as on January 1st.

At the end of 1949, the Mexican Congress authorized a new domestic silver-coinage program that provided for the minting of 1-peso, 50-centavo, and 25-centavo coins, to be composed of 300 parts of silver, 100 parts nickel, 100 parts zinc, and 500 parts copper. As of December 31, 1950, the following, in face value, had been minted: Of 1-peso coins, 3,360,000 pesos; of 50-centavo coins, 6,880,000 pesos; of 25-centavo coins, 19,140,000 pesos. Toward the end of 1950 the Bank of Mexico announced that it planned to mint a new issue of 5-peso coins to contain 720 parts of silver and 280 parts of copper.

Republic of the Philippines.—Although handicapped by import and exchange controls in obtaining supplies and equipment, some prewar gold mines made progress in rehabilitation, and others already in production were able to increase their output. Of the 54 prewar gold producers, only 9 were in actual operation in 1950. Gold production in the Philippines in 1950 was 333,991 ounces, compared with 287,844 ounces in 1949 and the all-time high of 1,144,332 ounces in 1941. The Philippine producers enjoy the privilege of selling up to 75 percent of their output in the domestic "free market," and turning over to the Government the remaining 25 percent at the world price of $35 an ounce. It is reported that, with this arrangement, the mining companies could realize an average of approximately $50 an ounce for their gold in 1950.[5] Several mines rehabilitating their plants in 1950 may add to the Philippine production in 1951.

Production of silver was 216,034 ounces in 1950 compared with 218,419 in 1949.

Union of South Africa.—An outstanding feature of the gold-mining industry in 1950 was the progress made in developing the new gold field in the Orange Free State. Twenty-five shafts were sunk or were being sunk on 13 properties, and extensive horizontal development workings were started. Two of the mines are expected to reach the production stage in 1951, four in 1952, and the remainder between 1953 and 1956. It is estimated that, when they are in full production, the new mines will have an output of about 8,000,000 ounces of gold annually.[6] The two most advanced mines, the Welkom and the St. Helena, will each have an initial plant capacity of 50,000 tons of ore per month. This new gold field lies about 150 miles south-southwest from Johannesburg and centers around Odendaalsrus; at present it measures about 30 miles long and 10 miles across at the widest point. The gold occurs in conglomerate beds or "reefs" generally similar in character to the gold-bearing formations extensively worked on the Rand; they have been intersected by borings at depths ranging between about 1,400 feet and 7,000 feet. Almost 500 drill holes have been put down to prove the deposits; underground development results have been very satisfactory. Data presently available indicate that rock temperatures at comparable depths will be higher than those on the Rand.

[5] Mining World, Apr. 15, 1951, p. 88.
[6] Mining Journal (London), May 1951, p. 135.

In the Transvaal some mines on the Far West Rand, in development in 1950, are scheduled to go into production in 1951 and 1952.

Gold was paid for throughout the year at 248s. 3d. per fine troy ounce. The increased price made it possible to mine ore containing less gold, and on the Rand the average grade of the ore treated was 3.759 dwt. per ton—a new record low. The tonnage milled increased by about 2,600,000 tons to 59,515,200 tons, but the gold output declined slightly to 11,663,713 ounces. Sales of some gold, at enhanced prices, for industrial and artistic purposes increased the gross revenue derived from mining by about 1.5 percent.

TABLE 29.—Salient statistics of gold mining in the Union of South Africa, 1946–50

[Transvaal Chamber of Mines]

	1946	1947	1948	1949	1950
Ore milled (tons)	56,927,500	53,712,300	55,285,700	56,881,550	59,515,200
Gold recovered (fine ounces)	11,917,914	11,197,638	411,574,871	11,708,013	11,663,713
Gold recovered (dwt. per ton)	4.024	3.982	4.012	3.942	3.759
Working revenue	£99,249,814	£92,740,023	£96,179,355	£110,617,476	£139,491,029
Working revenue per ton	34s. 10d.	34s. 7d.	34s. 9d.	38s. 11d.	46s. 11d.
Working cost	£72,920,881	£71,309,136	£72,383,938	£76,667,643	£87,956,643
Working cost per ton of ore	25s. 7d.	26s. 7d.	26s. 2d.	27s. 0d.	29s. 7d.
Working cost per ounce of metal	127s. 4d.	133s. 4d.	130s. 7d.	136s. 9d.	157s. 5d.
Working profit	£26,328,933	£21,430,887	£23,790,417	£33,949,793	£51,534,386
Working profit per ton	9s. 3d.	8s. 0d.	8s. 7d.	11s. 11d.	17s. 4d.
Dividends	£13,406,349	£11,845,035	£13,419,443	£17,394,046	£25,769,759

Gypsum

By Oliver S. North and May G. Downey

GENERAL SUMMARY

PRODUCTION of gypsum and gypsum products in 1950 set new all-time records in nearly every category. Domestic production of 8,192,625 short tons of crude gypsum was well above the 1948 figure. All of the important gypsum products, led by prefabricated board and lath and particularly tile, which was up 58 percent, were manufactured in record quantities. Most of the plasters showed gains of about one-third.

The moving force behind these new records was the construction boom throughout the Nation. Nonresidential building continued at a high level, and new dwelling starts were at new highs through most of 1950. The importance of housing to the gypsum industry is emphasized by the fact that, whereas home building was up about 250 percent from 1939, production of board and lath had quadrupled. More gypsum products are used in homes than ever before.

Although many new production facilities were in operation, shortages of board, lath, and other materials were reported to have delayed completion of small dwelling units in some metropolitan areas and to have slowed the start of others.

To meet unusual demands, many plants rushed through expansion and improvement plans, which were to carry through into 1951. Although tightened credit was expected to cut back housing starts appreciably in 1951, other types of building construction were expected to be of sufficient volume to maintain gypsum demand at a high level.

TABLE 1.—Salient statistics of the gypsum industry in the United States, 1946–50

	1946	1947	1948	1949	1950
Active establishments [1]	80	93	95	88	87
Crude gypsum: [2]					
Mined ... short tons	5,629,398	6,208,216	7,254,535	6,608,118	8,192,625
Imported ... do	1,457,140	2,157,049	2,859,209	2,593,329	3,190,600
Apparent supply ... do	7,086,538	8,365,265	10,113,744	9,201,447	11,383,225
Calcined gypsum produced: [3]					
Short tons	4,169,662	5,010,918	6,243,392	5,767,163	7,341,024
Value	$29,272,960	$38,726,405	$48,144,806	$45,455,419	$60,479,573
Gypsum products sold: [4]					
Uncalcined uses:					
Short tons	1,641,279	1,950,181	2,226,026	1,989,893	2,218,286
Value	$5,105,789	$7,012,106	$7,927,266	$7,127,497	$7,911,988
Industrial uses:					
Short tons	207,178	207,226	219,472	211,635	266,192
Value	$3,160,988	$3,430,022	$3,731,489	$3,562,017	$4,530,159
Building uses:					
Value	$88,927,786	$117,973,351	$165,175,523	$148,056,853	$193,734,651
Total value	$97,194,563	$128,415,479	$176,834,278	$158,746,367	$206,176,798
Gypsum and gypsum products:					
Imported for consumption	$1,833,088	$2,523,936	$3,114,762	$2,851,289	$3,563,696
Exported	$1,065,248	$1,599,578	$1,317,042	$1,936,148	$1,046,458

[1] Each mine, plant, or combination mine and plant is counted as 1 establishment.
[2] Excludes byproduct gypsum.
[3] Includes production from byproduct gypsum in 1946 only. Since then, all byproduct has been reported as used in uncalcined products.
[4] Made from domestic, imported, and byproduct crude gypsum.

ANHYDRITE

The production of anhydrite is of major importance in Great Britain, where the principal source of supply is the Teeside area in northeastern England. Resources in the Billingham area are likely to be at least 75 million tons. Further large deposits exist south of the Tees River. Reserves are clearly adequate to meet requirements at the present rate of consumption for many years to come.[1]

A small amount of anhydrite is produced in Canada, largely for export to the southeastern United States for use as a fertilizer for the peanut crop.[2]

DOMESTIC PRODUCTION

Crude.—The output of crude gypsum from mines in the United States reached the record figure of 8,192,625 tons in 1950. This tonnage was

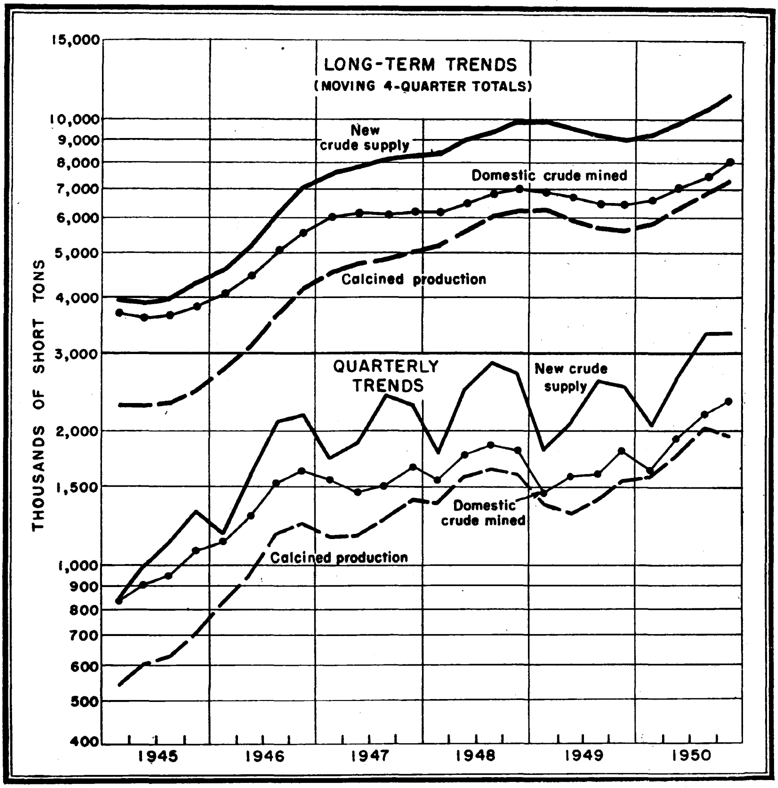

Figure 1.—Trends of new crude supply, domestic crude mined, and production of calcined gypsum, 1945–50, by quarters.

24 percent greater than the production in 1949 and 13 percent more than in the previous record year, 1948. Every producing State or district reported an increase in output. A total of 57 mines reported

[1] Mining and Engineering Journal, vol. 60, pt. 2, No. 2971, Jan. 21, 1950, p. 703.
[2] Rock Products, vol. 53, No. 6, June 1950, p. 109.

output in 1950; of these, 38 were open-pit operations, 15 were underground mines, and 4 were combination pit-underground mines.

Calcined.—Fifty-one plants, with 221 pieces of calcining equipment, sent the output of calcined gypsum to a new high with a production of 7,341,024 tons, 27 percent above the 1949 figure and 18 percent above that of 1948, formerly the record year. Production of calcined gypsum, the form in which most gypsum is utilized, is considered the most accurate over-all yardstick of the industry, as it includes both domestic and imported raw material.

TABLE 2.—Crude gypsum mined in the United States, 1948–50, by States [1]

State	Active mines			1948		194		1950	
	1948	1949	1950	Short tons	Value	Short tons	Value	Short tons	Value
California	15	13	11	962,038	$2,354,390	753,581	$1,852,452	962,373	$2,462,604
Iowa	4	5	5	729,880	1,753,545	858,464	2,188,002	981,647	2,507,651
Michigan	4	4	4	1,309,331	3,617,868	1,264,511	3,470,294	1,474,210	4,090,777
Nevada	7	5	4	519,552	1,222,070	495,229	1,347,666	604,604	1,614,107
New York	7	6	6	1,228,358	3,294,973	916,117	2,805,154	1,280,100	3,876,176
Texas	5	5	5	893,704	2,143,539	843,292	2,178,569	1,076,251	2,771,812
Other:									
Arizona	3	3	2						
Arkansas	1	1	1						
Kansas	2	2	2	264,738	587,134	234,575	515,577	333,228	706,451
Louisiana	----	----	1						
New Mexico	1	1	----						
Colorado	2	2	4						
Montana	2	2	2						
South Dakota	1	----	----	217,299	717,072	180,794	565,336	197,443	594,844
Washington	----	----	1						
Wyoming	2	3	1						
Ohio	2	2	2						
Oklahoma	2	2	2						
Utah	3	3	3	1,129,635	3,422,078	1,061,555	3,395,503	1,282,769	4,110,146
Virginia	1	1	1						
Total	64	60	57	7,254,535	19,112,669	6,608,118	18,318,553	8,192,625	22,734,568

[1] Production of some States is not shown separately, in order not to disclose individual company operations.

Mine and Calcining-Plant Developments.—Northwest Gypsum Co. has adopted a pump-and-pipe arrangement for carrying crushed material from the Idaho side of Snake River to the Oregon shore near Huntington, where a milling unit will process the gypsum. According to reports, 60 to 100 tons can be handled per hour.[3]

A Bureau of Mines publication discussed the gypsum operations of the Blue Diamond Corp., Clark County, Nev. The circular summarizes the history of company operations and describes the physical features and labor and living conditions. The geology, method of exploration, and mining practices, open-pit and underground, are described, as are the plants and the manufacturing procedures.[4]

Daily shipments of about 50 tons were being made from a large deposit of gypsum in Quatal Canyon, near Bakersfield, Calif. If an access road is built, Monolith Portland Cement Co., which is working the deposit, may build a plant at the site.[5]

[3] Pit and Quarry, vol. 43, No. 6, December 1950, p. 88.
[4] Holmes, G. H., Jr., Mining, Milling, and Manufacturing Methods at the Blue Diamond Corp.'s Gypsum Property, Clark County, Nev.: Bureau of Mines Inf. Circ. 7555, March 1950, 21 pp., 13 figs.
[5] Engineering and Mining Journal, vol. 151, No. 9, September 1950, p. 114.

U. S. Gypsum Co., using modern equipment in all operations, is mining and calcining about 350 tons of gypsum rock per day from a deposit at Heath, Fergus County, Mont.[6]

It was reported that W. H. Coplen and his associates were installing a 25-ton mill at their gypsum-sulfur mine at Dixie Valley, Nev., and planned to utilize the material, which contains about 20 percent free sulfur and 13 percent gypsum, in the manufacture of a fertilizer for neutralizing alkaline soils.[7]

Shipments of gypsum for use in cement retarder were begun by Anderson-Dunham Co., Baton Rouge, La., from its Winnfield quarry. The company expects to ship about 10 carloads per day to cement mills in south central States.[8]

CONSUMPTION AND USES

The unprecedented boom in both residential and nonresidential construction created a vigorous demand in 1950 for all building materials, including gypsum products. During the first 9 months of 1950 nonfarm housing-unit starts were far ahead of similar periods of the preceding years; and by middle and late summer local shortages of various gypsum products, especially board and lath, were noted. This high level of housing starts tapered off in the latter months of 1950, and supply began to catch up with demand in some quarters. This was due to a slightly lessened demand, near-capacity production by existing facilities, activation of new plants, and expansions and improvements in many factories.

The total building uses, in dollar value, were 31 percent above 1949 and 17 percent above 1948.

TABLE 3.—Calcined gypsum produced in the United States, 1949–50, by districts

District	1949		1950	
	Short tons	Value	Short tons	Value
New Hampshire, Massachusetts, and Connecticut	189, 189	$1, 613, 134	260, 721	$2, 343, 843
Eastern New York, New Jersey, Pennsylvania, Georgia, and Florida	1, 147, 538	9, 856, 213	1, 359, 269	12, 069, 598
Ohio, Virginia, Indiana, and Maryland	923, 490	8, 102, 675	1, 095, 613	10, 073, 719
Western New York	612, 044	4, 214, 174	848, 865	5, 616, 168
Michigan	529, 614	3, 926, 362	683, 726	5, 402, 066
Iowa	531, 109	3, 511, 681	631, 919	4, 574, 214
Kansas and Oklahoma	308, 507	2, 480, 122	361, 984	3, 131, 925
Texas	561, 778	3, 930, 599	752, 615	5, 566, 132
Colorado, Montana, Utah, and New Mexico [1]	243, 205	2, 078, 000	299, 178	3, 227, 565
California, Nevada, and Arizona	720, 689	5, 742, 459	1, 047, 134	8, 474, 343
Total	5, 767, 163	45, 455, 419	7, 341, 024	60, 479, 573

[1] No production from New Mexico in 1950.

[6] Mining World, vol. 12, No. 7, June 1950, p. 75.
[7] Mining World, vol. 12, No. 3, March 1950, p. 77.
[8] Rock Products, vol. 53, No. 11, November 1950, p. 104.

TABLE 4.—Active calcining plants and equipment in the United States, 1948–50, by States

State	1948			1949			1950		
	Calcining plants	Equipment		Calcining plants	Equipment		Calcining plants	Equipment	
		Kettles	Other calciners [1]		Kettles	Other calciners [1]		Kettles	Other calciners [1]
California	4	10	5	4	10	7	5	10	8
Iowa	5	19	4	5	18	4	5	22	4
Michigan	4	20	--------	4	20	1	4	20	1
New York	7	22	6	7	22	6	7	22	6
Texas	4	27	--------	4	29	1	4	30	1
Other States [2]	29	77	26	27	74	24	26	74	23
Total	53	175	41	51	173	43	51	178	43

[1] Includes rotary and beehive kilns, grinding-calcining units, and hydrocal cylinders.

[2] Comprises calcining plants in 1948–50 as follows: 1 each in Arizona, Connecticut, Florida, Georgia, Indiana, Maryland, Massachusetts, New Hampshire, New Jersey, New Mexico (none in 1950), Oklahoma, Pennsylvania, South Dakota (none in 1949–50), and Wyoming (none in 1949–50); 2 each in Colorado, Kansas, Montana, Nevada, Ohio, and Virginia; 3 in Utah.

Gypsum-Products Plant Developments.—U. S. Gypsum Co. continued to expand and improve a number of its plants. Plans were announced for enlarging and improving its manufacturing facilities

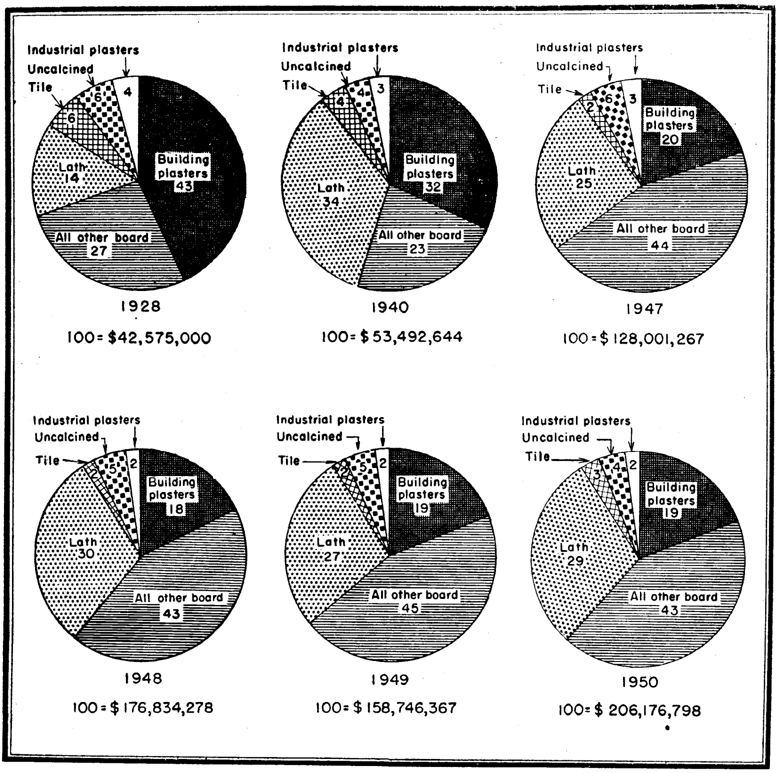

FIGURE 2.—Percentage distribution of total sales value, f. o. b. plant, of gypsum products in 1928, 1940, and 1947–50, by groups of products.

at Sweetwater, Tex., at a cost of $1,000,000. The gross annual output of the Sweetwater plant is $12,000,000 worth of gypsum wallboard, lath, plaster, sheathing, and other related materials.[9]

TABLE 5.—Gypsum products (made from domestic, imported, and byproduct crude gypsum) sold or used in the United States, 1949–50, by uses

Use	1949			1950			Percent of change in—	
	Short tons	Value		Short tons	Value			
		Total	Average		Total	Average	Tonnage	Average value
Uncalcined:								
Portland-cement retarder	1,528,440	$4,990,796	$3.27	1,720,936	$5,552,952	$3.23	+13	−1
Agricultural gypsum	425,646	1,788,758	4.20	465,359	1,990,507	4.28	+9	+2
Other uses [1]	35,807	347,943	9.72	31,991	368,529	11.52	−11	+19
Total uncalcined uses	1,989,893	7,127,497	3.58	2,218,286	7,911,988	3.57	+11	(2)
Industrial:								
Plate-glass and terra-cotta plasters	48,159	509,471	10.58	63,727	683,791	10.73	+32	+1
Pottery plasters	42,784	678,742	15.86	49,748	810,561	16.29	+16	+3
Orthopedic and dental plasters	9,738	321,757	33.04	10,758	356,929	33.18	+10	(2)
Other industrial uses [3]	110,954	2,052,047	18.49	141,959	2,678,878	18.87	+28	+2
Total industrial uses	211,635	3,562,017	16.83	266,192	4,530,159	17.02	+26	+1
Building:								
Cementitious:								
Plasters:								
Base-coat	1,824,790	21,350,581	11.70	2,334,656	28,246,739	12.10	+28	+3
Sanded	112,375	1,170,589	10.42	125,948	1,579,263	12.54	+12	+20
To mixing plants	17,964	169,209	9.42	16,073	163,411	10.17	−11	+8
Gaging and molding	179,873	2,554,618	14.20	219,417	3,261,444	14.86	+22	+5
Prepared finishes	19,388	972,474	50.16	19,659	1,044,512	53.13	+1	+6
Other [4]	125,407	2,811,815	22.42	168,065	4,025,662	23.95	+34	+7
Keene's cement	44,624	919,816	20.61	57,797	1,255,458	21.72	+30	+5
Total cementitious	2,324,421	29,949,102	12.88	2,941,615	39,576,489	13.45	+27	+4
Prefabricated:								
Lath	1,519,776	43,060,474	[5] 21.36	2,131,466	60,621,179	[5] 21.70	[6] +39	+2
Wallboard and laminated board	2,036,548	68,493,078	[7] 28.03	2,551,653	84,693,753	[7] 29.16	[6] +19	+4
Sheathing board	102,825	3,267,935	[5] 33.68	121,327	3,850,763	[5] 33.84	[6] +17	(2)
Tile	163,587	3,286,264	[8] 73.17	257,536	4,992,467	[8] 75.26	[6] +58	+3
Total prefabricated	3,822,736	118,107,751	30.90	5,061,982	154,158,162	30.45	[6] +28	−1
Total building uses		148,056,853			193,734,651			
Grand total value		158,746,367			206,176,798			

[1] Includes uncalcined gypsum sold for use as filler and rock dust, in brewer's fixe, in color manufacture, and for unspecified uses.
[2] Less than ±0.5 percent.
[3] Includes statuary, industrial casting and molding plasters, dead-burned filler, granite polishing, and miscellaneous uses.
[4] Includes insulating and roof-deck, joint filler, patching and painter's plaster, and unclassified building plasters.
[5] Average value per M square feet.
[6] Percent of change in square footage.
[7] Average value per M square feet of wallboard only.
[8] Average value per M square feet of partition tile only.

[9] Pit and Quarry, vol. 42, No. 8, February 1950, p. 47.

232294—53——39

The capacity of U. S. Gypsum's Jacksonville, Fla., plant was doubled during the year, making it "the largest gypsum mill in the southeast," according to officials of the concern. The plant furnishes products to consumers in all of the southeastern States.[10]

U. S. Gypsum also doubled the capacity of its Fort Dodge, Iowa, plant, which produces wallboard, plaster, plaster base, sheathing, and other building materials.[11]

National Gypsum Co. announced a $1,000,000 expansion program. New warehouses are to be built at its plants at Clarence Center, N. Y., and National City, Calif.[12]

A trade journal dedicated one of its issues to National Gypsum Co., with an extensive coverage of the history and policies of that firm.[13]

Certain-teed Products Corp., Ardmore, Pa., began construction on a new gypsum-board plant at Fort Dodge, Iowa.[14]

Columbia Gypsum Co. was reportedly constructing a plaster and agricultural gypsum plant at Greenacres, Wash.[15]

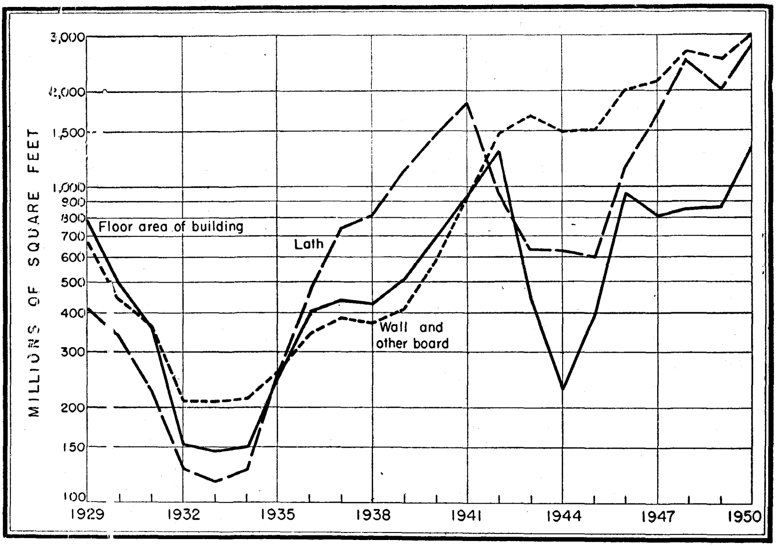

FIGURE 3.—Trends in sales of gypsum lath and wallboard and other board (includes wallboard, laminated board in terms of component board, and sheathing), compared with Dodge Corp. figures on combined floor area of residential and nonresidential building, 1929–50.

Kaiser Gypsum, a division of Kaiser Industries, Inc., Oakland, Calif., announced that it would operate the Standard Gypsum plant at Long Beach, Calif., and a gypsum-manufacturing unit at Redwood City, Calif.[16]

Certain-teed Products Corp. acquired the Phoenix, Ariz., plant of Union Gypsum Co. and announced plans that include the building of a gypsum wallboard and lath plant and the enlargement of present facilities.[17]

[10] Pit and Quarry, vol. 42, No. 8, February 1950, p. 71.
[11] Rock Products, vol. 53, No. 5, May 1950, p. 55.
[12] Rock Products, vol. 53, No. 9, September 1950, p. 61.
[13] Rock Products, vol. 53, No. 12, December 1950, pp. 83–127.
[14] Rock Products, vol. 53, No. 2, February 1950, p. 85.
[15] Pit and Quarry, vol. 42, No. 12, June 1950, p. 48.
[16] Rock Products, vol. 53, No. 3, March 1950, p. 55.
[17] Rock Products, vol. 53, No. 12, December 1950, p. 73.

Celotex Corp., Chicago, acquired the plaster plant and gypsum deposits of the Wasem Plaster Co. at Fort Dodge, Iowa.[18]

TABLE 6.—Gypsum board and tile sold or used in the United States, 1946–50, by types

Year	Lath			Wallboard		
	M square feet	Value		M square feet	Value	
		Total	Average [1]		Total	Average [1]
1946	1,147,353	$18,550,334	$16.17	1,900,779	$43,699,483	$22.99
1947	1,703,818	32,241,998	18.92	2,046,216	53,122,413	25.96
1948	2,504,733	53,596,957	21.40	[2] 2,531,865	[2] 72,071,432	[3] 28.40
1949	2,015,638	43,060,474	21.36	[2] 2,439,121	[2] 68,493,078	[3] 28.03
1950	2,793,620	60,621,179	21.70	[2] 2,901,947	[2] 84,693,753	[3] 29.16

Year	Sheathing			Laminated board			Tile [4]		
	M square feet	Value		M square feet [5]	Value		M square feet	Value	
		Total	Average [1]		Total	Average [1]		Total	Average [6]
1946	76,914	$2,021,691	$26.29	21,317	$792,560	$37.18	18,865	$1,814,487	$47.92
1947	106,482	3,534,686	33.20	1,741	202,683	116.42	26,769	2,775,676	67.37
1948	129,632	4,431,544	34.19	(2)	(2)	(7)	27,181	3,091,547	72.40
1949	97,037	3,267,935	33.68	(2)	(2)	(7)	28,518	3,286,264	73.17
1950	113,785	3,850,763	33.84	(2)	(2)	(7)	45,032	4,992,467	75.26

[1] Per M square feet, f. o. b. producing plant.
[2] Laminated board included with wallboard.
[3] Average value per M square feet of wallboard.
[4] Includes partition, roof, floor, soffit, shoe, and all other gypsum tiles and planks.
[5] Area of component board and not of finished product.
[6] Per M square feet, f. o. b. producing plant, of partition tile only.
[7] Bureau of Mines not at liberty to publish figure.

PRICES

Producers reported that the average value of crude gypsum mined was $2.78 per ton ($2.77 in 1949). Among uncalcined uses, the unit values of portland-cement retarder and agricultural gypsum remained virtually unchanged from 1949 at $3.23 and $4.28 per ton, respectively. The values of industrial gypsum products showed minor gains. Prefabricated materials and plasters advanced uniformly and moderately in average value, except for sanded plaster, which was 20 percent higher than in 1949.

On November 27, 1950, the Supreme Court of the United States upheld a decree by the United States District Court for the District of Columbia finding that seven of the larger gypsum products manufacturing companies, by their concerted action to fix prices and control methods of distribution through industry-wide license agreements, had gone beyond the scope of their patents and had violated the Sherman Anti-Trust Act. The Supreme Court also ordered the District Court to amend its decree so that it would, among other things, (1) prohibit price fixing by license agreements not only in the eastern part of the United States but throughout the country; (2) apply to all gypsum products instead of only patented gypsum board; and (3) forbid concerted agreements standardizing trade practices and calculating prices according to a delivered price system.[19]

[18] Rock Products, vol. 53, No. 11, November 1950, p. 106.
[19] *United States* v. *United States Gypsum Co., et al.*, 340 U. S. 76 (1950).

FOREIGN TRADE [20]

Imports of crude gypsum into the United States increased to 3,190,600 short tons, 93 percent of which was imported from Canada and represented slightly more than one-fourth of the apparent domestic supply. An increased tonnage came from Mexico, and for the first time Jamaica exported a considerable quantity to this country.

TABLE 7.—Gypsum and gypsum products imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Crude (including anhydrite)		Ground		Calcined		Keene's cement		Alabaster manufactures [1] (value)	Other manufactures, n. e. s. (value)	Total value
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value			
1946	1,457,140	$1,618,334	354	$7,308	255	$6,918	162	$3,686	$119,937	$73,573	$1,829,756
1947	2,157,049	2,269,583	477	13,228	130	3,793	(2)	27	204,954	32,351	2,523,936
1948	2,859,209	2,977,809	404	13,960	11	610	12	728	83,245	38,410	3,114,762
1949	2,593,329	2,693,824	613	14,209	209	8,036	------	-------	55,569	79,651	2,851,289
1950	3,190,600	3,256,251	716	15,787	237	7,900	1	173	61,444	222,141	3,563,696

[1] Includes imports of jet manufactures, which are believed to be negligible.
[2] Less than 0.5 ton.

TABLE 8.—Crude gypsum (including anhydrite) imported for consumption in the United States, 1948–50, by countries

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada-Newfoundland	2,692,414	$2,775,455	2,428,417	$2,468,124	2,952,336	$3,010,115
China	(1)	11	3	667	2	449
Dominican Republic	5,756	24,185	16,070	78,709	----------	----------
Italy	----------	----------	----------	----------	1	34
Jamaica	----------	----------	----------	----------	7,392	32,250
Mexico	161,039	178,158	148,839	146,324	230,869	213,403
Total	2,859,209	2,977,809	2,593,329	2,693,824	3,190,600	3,256,251

[1] Less than 0.5 ton.

TABLE 9.—Gypsum and gypsum products exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Crude, crushed, or calcined [1]		Plasterboard, wallboard, and tile		Other manufactures, n. e. s. (value)	Total value
	Short tons	Value	Square feet	Value		
1946	19,626	$400,319	12,405,583	$417,750	$247,179	$1,065,248
1947	33,208	622,034	19,417,487	645,448	332,096	1,599,578
1948	10,797	259,728	16,506,127	615,845	441,469	1,317,042
1949 [2]	17,567	423,478	53,313,138	1,336,269	176,401	1,936,148
1950 [2]	23,678	524,926	13,618,353	428,549	92,983	1,046,458

[1] Effective Jan. 1, 1949, calcined gypsum not separable from crude, crushed, or calcined.
[2] Due to changes in items included in each classification, data are not strictly comparable with earlier years (1946–48).

[20] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TECHNOLOGY

Committee C–11 on gypsum met at the National Bureau of Standards, Washington, D. C., on May 12. Most of the business transacted at this meeting was related to the presentation, discussion, and final acceptance of long-pending revisions of several standards. One of the principal revisions was substitution of a compressive strength requirement in place of tensile strength. A reorganization of the committee was approved which will streamline the work through reduction in subcommittees from four to two. The two subcommittees will be known as Subcommittee I on Plasters, and Subcommittee II on Structural Products.[21]

A report was published of theoretical work on the system $CaSO_4$–H_2O, involving specific heat measurements, heat of hydration, thermodynamic data, dissociation-equilibrium measurements, and stability diagrams reviewed in terms of practical calcining. This is a review and extension of the data in Bureau of Mines Technical Paper 625.[22]

A study of the effect of gypsum content on compressive strengths of cements was reported.[23]

Report was made of the conversion of a shuttlecar from storage-battery to Diesel-electric power for speedier and more economical underground haulage in a gypsum mine at Acme, Tex. Efficiency of the Diesel-electric power was reported at about 95 percent. Air samples tested showed virtually normal air, free from objectionable contamination.[24]

A new low-water, high-strength gypsum cement was reported. The product is said to make possible the fabrication of pure gypsum plaster casts having compressive strengths of from 10,000 to 15,000 p. s. i.[25]

WORLD REVIEW

Australia.—The huge gypsum deposit at Lake MacDonnell in South Australia attracted renewed interest and activity, as Waratah Gypsum Pty., Ltd., proceeded with small-scale production while making plans for the construction of a branch railway line from Kowulka to the deposit, erection of a new wharf, and eventual completion of a large new factory at Thevenard. Reserves at Lake MacDonnell cover 34 square miles and are estimated to total 765 million tons, chiefly of rock gypsum carrying less than 0.2 percent insolubles and more than 94 percent gypsum. Chief impurities are calcium carbonate and common salt. Large-scale development of this deposit would meet local and export demands indefinitely, and obviate the necessity for working a number of other smaller, low-grade deposits.[26]

---

[21] American Society for Testing Materials, Bull. 167, July 1950, p. 50.
[22] Riddell, W. C., Physical Properties of Calcined Gypsum: Rock Products, vol. 53, No. 5, May 1950, pp. 68–71, 102.
[23] Rutle, J., Effect of Gypsum Content on Compressive Strengths of Cements: Pit and Quarry, vol. 43, No. 1, July 1950, pp. 87–88.
[24] Platt, D. H., Shuttle-car Conversion From Storage-Battery to Diesel-Electric Power, Acme Mine, Certain-teed Products Corp., Acme, Hardeman County, Tex.: Bureau of Mines Rept. of Investigations 4643, 1950, 22 pp.
[25] Rock Products, vol. 53, No. 5, May 1950, p. 55.
[26] Chemical Engineering & Mining Review, vol. 42, No. 7, Apr. 10, 1950, p. 268.

TABLE 10.—World production of gypsum, by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Algeria	22,250	28,600	38,345	33,258	31,881	46,097
Anglo-Egyptian Sudan	2,106	3,063	350	3,045	1,496	(2)
Argentina [3]	91,504	(2)	(2)	(2)	(2)	(2)
Australia	108,894	167,794	217,639	280,853	291,854	[4] 204,581
Austria	(2)	24,012	15,096	26,376	(2)	(2)
Belgian Congo	----------	----------	----------	----------	----------	7,190
Brazil	(2)	(2)	(2)	(2)	50,857	(2)
Bulgaria [5]	5,000	5,000	5,000	5,000	(2)	(2)
Canada	753,615	1,838,895	2,362,365	3,164,211	2,854,999	3,256,398
Ceylon	59	33	69	170	37	(2)
Chile	47,162	92,400	100,800	35,056	60,303	(2)
China	(2)	(2)	50,000	[5] 55,000	(2)	(2)
Colombia	(2)	(2)	17,372	4,200	[5] 2,760	1,930
Cuba [5]	10,400	14,300	14,900	16,500	13,880	15,500
Cyprus (exports)	2,608	15,464	7,844	19,500	25,788	65,485
Dominican Republic	[6] 3,258	[6] 10,974	13,393	7,304	18,157	(2)
Ecuador	----------	----------	----------	410	486	[5] 441
Egypt	96,565	78,316	72,337	95,243	(2)	(2)
Finland	(2)	(2)	(2)	1,711	(2)	(2)
France	724,000	1,746,375	2,229,940	2,254,181	1,062,000	2,100,000
French Morocco	8,740	15,135	17,285	30,136	15,425	(2)
Germany: Federal Republic	(2)	[7] 163,800	[7] 150,700	[7] 316,600	[7] 515,300	[5 7] 344,000
Greece	----------	5,150	850	(2)	(2)	(2)
India	92,229	77,643	51,381	107,445	142,190	(2)
Ireland	23,400	37,894	36,415	62,693	(2)	(2)
Israel-Jordan	7,542	14,512	(2)	(2)	(2)	23,623
Italy	162,080	236,104	298,224	(2)	(2)	(2)
Jamaica	----------	----------	----------	7,112	(2)	(2)
Japan	83,421	49,763	61,555	113,754	117,123	114,505
Kenya	209	508	659	1,016	181	610
New Caledonia	8,030	6,750	2,705	779	17,119	15,200
Pakistan	(2)	(2)	16,121	6,361	15,645	[5] 19,000
Peru	42,223	43,391	41,330	46,716	37,419	(2)
Philippines	(2)	----------	----------	818	2,710	2,883
Poland	(2)	9,787	14,917	14,183	26,361	(2)
Portugal	11,687	27,680	33,868	42,842	43,060	(2)
Spain	1,038,616	[8] 1,098,013	1,337,662	[8] 1,423,728	1,293,552	2,251,831
Sweden	288	----------	----------	----------	----------	(2)
Switzerland	97,000	68,000	165,000	[5] 165,000	[5] 80,000	[5] 80,000
Syria	----------	1,200	4,500	[5] 1,000	1,400	2,000
Thailand	(2)	87	71	200	154	(2)
Tunisia	8,900	8,985	17,650	19,130	22,066	(2)
Union of South Africa (sales)	66,085	66,228	80,166	78,625	88,232	103,707
United Kingdom:						
Great Britain	1,347,888	1,715,060	1,773,733	1,175,570	(2)	(2)
Northern Ireland	71	----------	----------	----------	----------	(2)
United States	3,457,919	5,106,877	5,631,969	6,581,169	5,994,752	7,432,186
Venezuela [9]	----------	973	3,451	2,406	3,042	2,050
Total (estimate) [1]	9,800,000	14,200,000	16,400,000	18,300,000	16,700,000	20,700,000

[1] In addition to the countries listed, gypsum is produced in Angola, Ethiopia, Iraq, Luxembourg, Mexico, Rumania, U. S. S. R., and Yugoslavia, but production data are not available. Estimates for these countries are included in the total.
[2] Data not available; estimate by senior author of chapter included in total.
[3] Rail and river shipments.
[4] Excluding New South Wales.
[5] Estimate.
[6] Exports.
[7] Crude production estimates based on the following calcined figures: 1946, 136,500 tons; 1947, 125,600; 1948, 263,822; 1949, 429,400; 1950, 286,592.
[8] Includes Spanish Morocco production: 1946, 1,219 tons; 1948, 1,829.
[9] Production in Government quarries only.

Brazil.—A partial survey of the Sao Francisco Valley, Bahia, area to be benefited by the electric power production at the Paulo Afonso Falls reveals that the region is rich in minerals, including gypsum.

Mineracão Rosado, Mossoro, Rio Grande, has introduced modern surface-mining practices into its mine, eliminating animal and much hand labor and thereby reducing casualties and increasing production by 129 percent. Hand labor is still used extensively to discover and select the different qualities of gypsum to be mined.[27]

Canada.—The gypsum deposits of Canada, both commercially active and those undeveloped, were discussed in an article.[28]

Gypsum, Lime & Alabastine, Canada, Ltd., was reported to have doubled the capacity of its board plant at Winnipeg.[29]

Negotiations were completed for the construction of two gypsum plants at a cost of $2,000,000 on the west coast of Newfoundland, at Humbermouth. The two plants will produce gypsum wallboard and pulverized gypsum for plaster and dental plates.[30]

The geographical occurrences of gypsum in Canada were described, and official statistics show that 13 mines and 10 mills, with a total daily rated capacity of 3,000 tons, are in operation.[31]

Columbia Gypsum Products, Inc., began to ship gypsum rock from its Windermere, B. C., mine to the calcining plant in Spokane, where it will be converted into soil conditioner and building products. Shipments from the mine have also been made to Calgary.[32]

Cyprus.—The Hellenic Chemical & Manures Co. opened a gypsum mine at Kalvassos and planned to begin export from its Vassiliko mine.[33]

Gypsum & Plasterboard Co., Ltd., proceeded with plans for the construction of a stucco and plasterboard factory.[34]

Ecuador.—A small production of gypsum to meet local cement demands continued.[35]

France.—The dual demand for gypsum in cement and sulfuric acid manufacture in France focused attention on its large deposits, which are said to be almost inexhaustible. Some formations in the south, for example, in Devoluy, are particularly rich, one at Lazer containing tens of millions of tons.[36]

French Morocco.—Production of crude gypsum is reported to approximate 15,000 metric tons per year. No calcined gypsum is reported.[37]

Germany.—Between Foerste and Dorste in the North Rhine-Westphalia area, Germany, deposits of gypsum ranging up to 20 meters in thickness and totaling 40 million tons have been described.[38]

Great Britain.—An estimate of 100 million tons gypsum reserve was made. It was stated that the firm of British Plaster Board retained dominance in British production, with 10 active mills, 16 active mines, and 1 quarry. The company produced about 800,000 tons in 1949 and has set an output target of 1½ million tons. The reserves and production of anhydrite were discussed.[39]

---

27 Rock Products, vol. 53, No. 7, July 1950, p. 47.
28 Northern Miner, vol. 36, No. 1, March 1950, p. 9.
29 Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 5, May 1950, p. 36.
30 Rock Products, vol. 54, No. 1, January 1951, p. 130.
31 Mines Branch, Department of Mines and Technical Surveys, Canada, List 3-5.
32 Rock Products, vol. 53, No. 11, November 1950, p. 105.
33 Mining World, vol. 12, No. 5, May 1950, p. 54.
34 Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 2, August 1950, p. 41.
35 Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, p. 47.
36 Chemical Age, vol. 47, No. 1607, Apr. 29, 1950, p. 664.
37 Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 6, June 1950, p. 36.
38 Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 3, September 1950, p. 39.
39 Mining & Engineering Journal, vol. 60, pt. 2, No. 2971, January 21, 1950, pp. 703, 705.

India.—The Geological Survey of India reports an occurrence of gypsum totaling 4,000,000 tons near Ran Village, Halar District, in Saurashtra Union, and has recommended that the Government investigate the area with a view to establishing commercial production.[40]

Kenya-Uganda.—It is reported that gypsum reserves in Kenya-Uganda, which have received increasing attention in recent years, may exceed 100 million tons. Quarries at Tula, Northern Frontier Province, produce a high-grade gypsum, from which the plaster of paris derived has been used by the medical department and for blackboard chalk by the education department. It is believed that greater use of the gypsum can be made in the Kenya building trade to replace the commonly used lime, cement, and sand wall surfacing.[41]

New Caledonia.—La Société le Nickel continued to limit exploitation of its gypsum concessions in Pouembout to the extraction and washing of only such amount as it needed for its nickel smelting operations at Doniambo.[42]

Pakistan.—Annual production approximated 16,000 tons, mostly from Punjab with its estimated reserve of 30,000,000 tons, and was used principally in the manufacture of fertilizer.[43]

Spain.—Gypsum is mined in five Provinces, with the Province of Guipuzcoa producing about two-thirds of the total.[44]

---

[40] Mining World, vol. 12, No. 7, July 1950, p. 47.
[41] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 3, September 1950, p. 39.
[42] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 2, February 1950, p. 41.
[43] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 4, October 1950, p. 39.
[44] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 2, February 1950, p. 41.

Helium

By Paul V. Mullins and Henry P. Wheeler, Jr.

GENERAL SUMMARY

THE Bureau of Mines is the only known producer of helium in commercial quantities in the world. Production facilities are centered in the southwestern part of the United States—at Amarillo and Exell, Tex.; Otis, Kans.; and Shiprock, N. Mex.—where relatively large volumes of helium-bearing natural gas are available.

At the beginning of 1950, the Exell plant was capable of producing enough helium to meet the demand: and the Amarillo, Otis, and Shiprock production facilities were in stand-by status. The demand increased steadily throughout the year, however, and it was necessary to reactivate the Amarillo plant in August. The combined production of the two Texas plants in 1950 was 81,394,416 cubic feet.

The Army, Navy, Air Force, Weather Bureau, and other agencies of the Federal Government requisition helium directly from the Bureau of Mines. The Bureau also makes helium available to non-Federal purchasers in accordance with regulations approved December 3, 1949 (30 CFR 1). More than 30 commercial distributors of compressed gases purchase helium from the Bureau of Mines for resale in at least 100 cities in 35 States, the District of Columbia, and the Territory of Hawaii.

The Amarillo plant continued to serve as headquarters for all Bureau of Mines helium facilities and as a purification and shipping point for helium in standard compressed gas cylinders.

RESERVES

Helium is a constituent of the atmosphere estimated at 1 part in 185,000–200,000 parts of air at the earth's surface. It also is found in small quantities in radioactive rocks and in gases from some mineral springs, volcanos, and fumaroles. The only known raw material from which helium can be extracted economically in large quantities, however, is helium-bearing natural gas. Usually the gases of higher helium contents are found in fields that lie over buried granite ridges, such as the deeply buried Amarillo Mountains of the Texas Panhandle and the Nemaha Ridge of Kansas, and in fields that are closely associated with igneous intrusions, such as the Rattlesnake field of San Juan County, N. Mex.

Cliffside Field (Potter County, Tex.).—The Government owns all gas rights in about 50,000 acres covering the entire geologic structure of the Cliffside field, which supplies natural gas containing about 1.8% helium to the Amarillo helium plant. Although this plant has produced more than 250,000,000 cubic feet of helium, the field's original wellhead pressure of 725 p. s. i. has been reduced only about 5½ percent. The remaining helium reserve is estimated to be about 2,000,000,000 cubic feet.

Channing Area (Moore, Potter, and Hartley Counties, Tex.).—The Exell helium plant is supplied with helium-bearing natural gas containing about 0.9 percent helium from 31 wells on about 70,000 acres in the Channing area of the Texas Panhandle gas field. The helium reserve available from this source is estimated at about 1,500,000,000 cubic feet.

Rattlesnake Field (San Juan County, N. Mex.).—The Government has acquired from the Navajo Tribe of Indians a long-term lease covering an important helium-bearing natural gas reserve that lies at a depth of about 7,000 feet in the Rattlesnake field. This reserve consists of natural gas with a helium content of 7½ percent and a nitrogen content of about 77 percent. A pipeline connects it with the Navajo helium plant at Shiprock, N. Mex. Royalties and rentals were paid in advance and the lease is free from obligations to produce, so the gas can be conserved until it is needed. The estimated helium reserve in the Rattlesnake field is about 788,000,000 cubic feet.

Otis Field and Vicinity (Rush, Barton, and Pawnee Counties, Kans.).—The Otis helium plant is supplied with helium-bearing natural gas containing approximately 1.4 percent helium from about 87 wells in the Otis, Ryan, Pawnee Rock, Behrens, Unruh, Dundee, Bergtol, and Ash Creek fields of Kansas. The helium reserve available from this source is estimated at about 850,000,000 cubic feet.

Other Reserves.—Lands of the public domain covering the Woodside structure in Emery County, Utah, and Harley Dome in Grand County, Utah, have been set aside as Helium Reserves 1 and 2, respectively. Exploratory wells found gas containing 1.3 percent helium in the Woodside structure and 7 percent in Harley Dome. The extent of these reserves is not known at present.

PRODUCTION

Table 1 gives helium production statistics for Government plants in the period 1921–50, inclusive.

TABLE 1.—Helium production in the United States, 1921–50

Calendar year	Plant	Cubic feet
1921—January 1929 [1]	Fort Worth, Tex., plant	46,088,787
1929 (April) [1]—1941	Amarillo, Tex., plant	131,614,437
1942	do	33,252,582
1943	All plants	116,307,437
1944	do	126,933,130
1945	do	94,733,744
1946	Amarillo and Exell, Tex., plants	58,236,385
1947	Exell, Tex., plant	70,297,700
1948	do	63,143,513
1949	do	55,165,482
1950	Amarillo and Exell, Tex., plants	81,394,416
Total 1921–50		[2] 877,167,613

[1] No helium was produced at Government helium plants in February or March 1929. The Fort Worth helium plant was shut down on Jan. 10, 1929, and the Amarillo helium plant was not put into operation until April.

[2] Includes 83,363,800 cubic feet extracted at the Exell plant from gas from the Channing area and injected into the Cliffside gas reservoir for conservation in calendar years 1945–49; none stored in 1950.

The Bureau of Mines Exell, Tex., and Otis, Kans., helium plants extract helium from natural gas that is produced by privately owned companies for distribution and sale in fuel markets, whether or not the helium is removed. Whenever possible, these plants are operated in preference to the Amarillo and Navajo (Shiprock) plants, which obtain helium-bearing natural gas from reserves owned or leased by the Government. The fields that supply the various plants with gas are listed in the section on Reserves. Natural gas is not produced in substantial quantity from the reserves available to the Amarillo and Navajo plants unless these plants are operating.

As long as one plant was adequate to meet the demand, the Exell plant alone was operated. In addition to the recovery of helium from gas going to fuel markets, operation of this plant offers another advantage. Because of its proximity to the Cliffside field (about 16 miles) and the Amarillo plant (about 30 miles), a high-pressure, 2-inch pipeline was constructed in 1945 to connect these facilities. Thus, it is possible for the Exell plant to operate at rated capacity and to inject any helium produced in excess of the demand into the Government-owned Cliffside field for storage and conservation. In the period 1945–49, a volume of 83,363,800 cubic feet of helium was conserved in this manner.

The demand for helium increased so rapidly in the last months of 1950 that the Amarillo plant was reactivated in August to bridge the gap until the Otis plant could be made ready. Although the operating facilities of the Amarillo plant were in a stand-by status similar to that at Otis, the Amarillo plant had continued to serve as a repurification and shipping facility for helium in standard cylinders, and a partially trained crew was available when the production facilities were needed. The Amarillo plant continued in production through February 1951, and the Otis plant was put into operation the following month.

SHIPMENTS

Helium is shipped in special railway tank cars, automotive trailers, and standard compressed-gas cylinders. The tank cars and trailers are owned by the Navy Department and are used primarily in the service of Federal agencies. Because it is nearer trucking facilities and for other reasons, the Amarillo helium plant handles the shipment of all helium in standard cylinders. In 1950 all tank-car shipments originated at the Exell plant. The two plants handled 1,207 shipments consisting of 64,907 standard cylinders and 305 tank cars.

CONSUMPTION AND USES

As indicated by the marked increase in production, the consumption of helium increased about 50 percent in 1950. Federal agencies requisitioned 55,480,608 cubic feet, or about 69 percent of the total, and non-Federal purchasers consumed 25,408,382 cubic feet, or 31 percent. This is very nearly the same percentage distribution experienced in 1949. The Navy continued to be the largest user of helium; its requirements accounted for 42,023.934 cubic feet, or more than 50 percent of the total consumption.

The Bureau continued to produce and distribute two grades of helium—grade D, of 98.2 percent purity or better, for the inflation of airships and balloons, and grade A, of 99.995 percent purity or better, for use in helium-shielded arc welding and for other purposes that require helium of extremely high purity. Grade A helium represented about 60 percent of the volume distributed in 1950.

Important uses of helium in 1950 were the same as in 1949. Airships, weather balloons, and helium-shielded arc welding continued to represent most of the demand. The importance of helium for medical purposes and in many types of research remained unchanged. In addition, a potentially great demand appeared to be imminent as the result of recent developments requiring the use of helium as an inert gas shield in the production and fabrication of titanium.

PRICES

Federal agencies requisition helium from the Bureau of Mines at a price that represents their proportionate shares of the expenses incident to the administration, operation, and maintenance of the Government's helium plants and properties. The price of helium to non-Federal purchasers at a helium plant selected by the Bureau is $13.50 per 1,000 cubic feet. An additional charge of $2.00 per 1,000 cubic feet is made when helium is delivered in standard cylinders.

FOREIGN TRADE

Helium is not produced commercially outside the United States. It can be exported from the United States only upon application to the Secretary of State and upon receipt of a license authorizing exportation.

TECHNOLOGY

The Bureau of Mines continued research on helium production and utilization at laboratories in Amarillo, Tex.

Because of its rapidly growing use and importance, much of the research dealt with production and utilization of high-purity, grade A helium. Accomplishments in this research included (1) improved process equipment for helium purification, (2) unique, supersensitive instruments for use as operating guides to indicate and record minute impurities in helium, and (3) progress in studies of grade A helium utilization, especially in shielded-arc welding.

In other research, the Bureau did investigative work on a variety of natural-gas and helium processing, transportation, and utilization problems, many of them of mutual interest to industry and the Bureau. In the field of utilization, the Bureau continued to assist oil and gas companies in obtaining field and reservoir data by using helium as a tracer in natural gas injected for pressure maintenance and recycling purposes.

Iron Ore

By Norwood B. Melcher and Jachin M. Forbes

GENERAL SUMMARY

SEVERAL important development programs, all related to national defense, characterized the iron-ore industry in 1950. As the Western World began its rearmament program in the hope of averting a third world war, the United States passed the Defense Production Act of 1950, the North Atlantic Treaty Organization was formed to weld the nations concerned into an effective defense unit, and preparation of the Japanese Peace Treaty was hastened in order that Japan could be integrated into the over-all pattern. Industrial expansion was highlighted by the United States steel industry's decision to raise annual capacity to 120 million tons by 1953—a decision that in time focused attention upon the iron-ore supply situation.

Adequacy of the iron-ore supply, which had already received considerable attention during the last decade, was intensively reexamined. It was concluded that the serious drain upon the direct-shipping iron

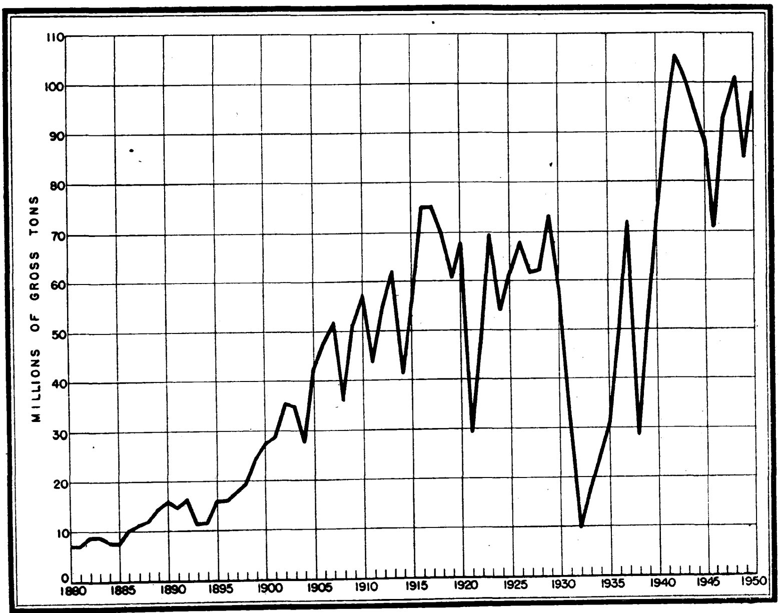

FIGURE 1.—Production of iron ore in the United States, 1880–1950.

ores of the Lake Superior region warranted acceleration of the program to produce large quantities of taconite concentrates, full and rapid development of the iron-ore deposits in Canada, Liberia, and Venezuela, and further exploration and development or expansion of deposits within the United States. The Defense Production Act of 1950 included provision for Government assistance in the exploration for and development of ore deposits; in addition, special aid in the form of accelerated tax amortization for new and expanded production facilities was authorized in the Internal Revenue Act of 1950.

Salient Statistics.—The domestic iron-mining industry, supported by a strong demand and unhampered by serious labor disputes, approached an output of 100 million tons in 1950. Undoubtedly, that level would have been exceeded if the Great Lakes transportation season had not opened late. Following the major steel strike in the fall of 1949, iron-ore consumption increased substantially; and, as the time passed for normal opening of Lake transportation, it became apparent that there would be difficulties in accumulating sufficient stocks of ore at lower Lake docks and furnace yards for the 1950–51 winter. Consequently, the mining and shipping industry took extraordinary measures to increase the movement of ore during the balance of the year. Emergency loads were permitted to September 30, navigation aids were maintained, and the Sault Ste. Marie locks were kept open until the last ship requesting passage was on its way. Nearly 1 million tons was shipped by lake in December 1950. Important additional tonnages were hauled in ships that normally convert to grain cargoes in the late months of the season; and all-rail movement of iron ore from Minnesota to Ohio and Pennsylvania was undertaken for the first time. A total of 3,686,182 gross (2,240-pound) tons are reported as having been shipped in this manner.

Crude-ore output from all domestic iron mines totaled 125,739,478 gross tons, within 1 million tons of the record 126,527,159 tons in 1942. "Usable" ore production was 98,045,360 tons, a total exceeded only in 1942, 1943, and 1948. Usable ore includes direct-shipping ore (mine product requiring no treatment), washed ore, concentrates, sinter, and byproduct cinder and sinter obtained from treating pyrites.

Although imports of iron ore increased 11 percent in 1950, the trend upward is at a modest rate compared with the upsurge expected in the next few years. The total—8,231,600 gross tons in 1950—was supplied from 3 leading sources—Chile, Sweden, and Canada—and 12 other sources with varying degrees of importance. Imports of 2,569,980 tons from Chile were off 2 percent from 1949 but still topped the list in magnitude. Sweden supplied virtually the same quantity of ore as in 1949 and remained in second position, while Canada in third position, increased its shipments to the United States 15 percent. No ore from new sources was received in 1950.

TABLE 1.—Salient statistics of iron ore in the United States, 1947–50

	1947	1948	1949	1950
Iron ore (usable; [1] less than 5 percent Mn):				
Production by districts:				
Lake Superior gross tons	76,531,769	82,630,430	68,494,123	79,627,294
Southeastern do	7,527,321	8,365,390	7,601,822	7,507,508
Northeastern do	3,987,195	4,422,971	3,863,833	4,474,834
Western do	4,502,512	5,104,703	4,441,671	5,860,755
Undistributed (byproduct ore) do	542,723	479,998	535,998	574,969
Total do	93,091,520	101,003,492	84,937,447	98,045,360
Production by types of product:				
Direct do	71,121,676	76,882,338	63,970,016	70,309,322
Concentrates do	17,058,162	19,055,357	16,412,639	22,810,818
Sinter do	4,368,959	4,585,799	4,018,794	4,350,251
Byproduct material (pyrites cinder and sinter) gross tons	542,723	479,998	535,998	574,969
Total do	93,091,520	101,003,492	84,937,447	98,045,360
Production by types of ore:				
Hematite do	84,535,465	90,686,138	76,262,577	87,157,960
Brown ore do	1,201,408	2,176,149	1,545,595	2,615,402
Magnetite do	6,811,876	7,661,207	6,593,277	7,697,029
Carbonate do	48			
Byproduct material (pyrites cinder and sinter) gross tons	542,723	479,998	535,998	574,969
Total do	93,091,520	101,003,492	84,937,447	98,045,360
Shipments do	93,314,635	100,821,714	84,687,275	97,764,410
Value	$320,864,981	$394,460,751	$381,515,831	$487,990,404
Average value per ton at mine	$3.44	$3.91	$4.50	$4.99
Stocks at mines Dec. 31 gross tons	6,036,244	6,284,773	5,333,660	5,725,569
Imports do	[2] 4,895,652	6,108,754	7,402,157	8,231,600
Value	[2] $22,072,768	$27,330,482	$36,790,743	$43,763,600
Exports gross tons	[2] 2,811,175	3,080,666	2,424,777	2,549,704
Value	[2] $10,013,941	$13,744,979	$14,653,817	$15,736,745
Consumption gross tons	96,115,549	100,498,557	89,218,498	106,610,273
Manganiferous iron ore (5 to 35 percent Mn):				
Shipments gross tons	1,048,531	1,196,933	962,853	971,069
Value	$3,447,149	([3])	$4,040,155	$4,609,432

[1] Direct-shipping ore, washed ore, concentrates, sinter, and byproduct pyrites cinder and sinter.
[2] Revised figure.
[3] Bureau of Mines not at liberty to publish figure.

PRODUCTION AND SHIPMENTS

The iron-mining industry shipped 125,902,113 gross tons of crude ore during 1950. Of this, 55,469,337 tons went to beneficiation plants and resulted in 22,810,818 tons of usable concentrates and 4,350,251 tons of sinter. Additional sintering operations at consuming plants used 14,124,504 tons of iron-ore fines and concentrates. Treatment at the mines included concentration by means of simple log washers, heavy-medium plants, other gravity methods, and magnetic separators and agglomeration by means of sintering machines and pelletizers. In addition, 613,706 tons of byproduct cinder and sinter were shipped by the pyrites industry. Except for crushing, in some instances, 70,432,776 tons of ore was shipped as mined. In all, 98,045,360 tons of usable iron ore, including byproduct ore, was produced at mines and mills in 1950. This represented an increase of 15 percent over 1949 as did the 97,764,410 tons shipped to consumers.

The output in 1950, excluding byproduct material noted above, came from 247 mines, of which 38 mined over 1,000,000 tons of crude ore each. Minnesota, Michigan, and Alabama continued as the leading producing States, with 67, 13, and 7 percent, respectively of the total usable ore in 1950. The Lake Superior district (Michigan,

TABLE 2.—Crude iron ore mined in the United States, by States and varieties, 1949–50, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

State	1949						1950					
	Number of mines	Hematite	Brown ore	Magnetite	Total	Rank	Number of mines	Hematite	Brown ore	Magnetite	Total	Rank
Alabama	[1] 24	6,811,252	3,525,578		10,336,830	3	[1] 37	6,599,287	4,286,200		10,885,487	3
Arkansas							1			23,000	23,000	15
California	1	536,525			536,525	12	2	830,731		714	831,445	11
Georgia	[1] 8		1,143,500		1,143,500	9	[1] 11	213	999,000		999,213	10
Michigan	37	11,199,024			11,199,024	2	37	12,691,101			12,691,101	2
Minnesota	123	66,479,532	146,936	[2] 47,000	66,673,468	1	130	81,503,383	478,985	186,000	82,168,368	1
Missouri	2	415,454	2,700		418,154	13	3	569,634	17,500		587,134	12
Nevada	1			3,094	3,094	14	1			5,465	5,465	17
New Jersey	4			921,422	921,422	10	4			1,090,826	1,090,826	9
New Mexico							1			14,284	14,284	16
New York	7	3,810		6,047,352	6,051,162	4	7	4,227		6,718,195	6,722,422	4
Pennsylvania	1			1,432,191	1,432,191	8	1			1,762,540	1,762,540	7
Texas	4		1,445,645		1,445,645	6	3		2,599,723		2,599,723	6
Utah	5			2,712,390	2,712,390	5	5			3,139,926	3,139,926	5
Virginia	1		4,220		4,220	15	1		25,000		25,000	14
Wisconsin	2	1,433,557			1,433,557	7	2	1,701,638			1,701,638	8
Wyoming	1	539,554			539,554	11	1	491,906			491,906	13
Total	221	87,418,708	6,268,579	11,163,449	104,850,736		247	104,392,120	8,406,408	12,940,950	125,739,478	
Percent of total		83.4	6.0	10.6	100.0			83.0	6.7	10.3	100.0	

[1] Excludes an undetermined number of small pits. Output of these pits included in tonnage given.
[2] Approximate figure.

Minnesota, and Wisconsin) produced 79,627,294 tons of ore, 16 percent above 1949 but 4 percent less than in 1948. The Southeastern district (Alabama, Georgia, and Virginia) decreased its output of usable ore in 1950, the output of 7,507,508 tons being 1 percent less than in 1949. The Northeastern and Western States made substantial increases, 16 and 32 percent, respectively, above 1949, which was in each instance a new all-time high. Percentage distribution of production was: Lake Superior district 81.7, Southeastern States 7.7, Northeastern States 4.6, and Western States 6 percent, compared with 81.2, 9, 4.6, and 5.3 percent, respectively, in 1949.

Direct-shipping ore constituted 71.7 percent of the total production; shipping-grade concentrates, 23.3 percent; and sinter, 5 percent. Hematite was the principal iron-bearing mineral; 89 percent of all usable ore was of this type. Magnetite comprised 8 percent; brown ore, 3 percent; and byproduct ore less than 1 percent. Of the crude-ore production, 23 percent was from underground mines and 77 percent from open pits.

TABLE 3.—Crude iron ore mined in the United States, 1949–50, by States and mining methods, in gross tons

State	1949			1950		
	Open pit	Underground	Total	Open pit	Underground	Total
Alabama	3,755,167	6,581,663	10,336,830	4,534,737	6,350,750	10,885,487
Arkansas					23,000	23,000
California	536,525		536,525	831,445		831,445
Georgia	1,143,500		1,143,500	999,000	213	999,213
Michigan	702,475	10,496,549	11,199,024	846,986	11,844,115	12,691,101
Minnesota	63,104,345	3,569,123	66,673,468	78,363,335	3,805,033	82,168,368
Missouri	418,154		418,154	586,665	469	587,134
Nevada	3,094		3,094	5,465		5,465
New Jersey		921,422	921,422		1,090,826	1,090,826
New Mexico				14,284		14,284
New York	3,709,424	2,341,738	6,051,162	4,261,761	2,460,661	6,722,422
Pennsylvania	627,399	804,792	1,432,191	659,514	1,103,026	1,762,540
Texas	1,445,645		1,445,645	2,599,723		2,599,723
Utah	2,712,390		2,712,390	3,139,926		3,139,926
Virginia	4,220		4,220	25,000		25,000
Wisconsin		1,433,557	1,433,557		1,701,638	1,701,638
Wyoming		539,554	539,554		491,906	491,906
Total	78,162,338	26,688,398	104,850,736	96,867,841	28,871,637	125,739,478
Percent of total	74.5	25.5	100.0	77.0	23.0	100.0

TABLE 4.—Crude iron ore shipped from mines in the United States, by States and disposition, 1949–50, in gross tons

State	1949			1950		
	Direct to consumers	To beneficiation plants	Total	Direct to consumers	To beneficiation plants	Total
Alabama	5,465,022	4,808,624	10,273,646	5,392,939	5,590,540	10,983,479
Arkansas					23,000	23,000
California	584,109		584,109	849,489		849,489
Georgia		1,143,500	1,143,500	213	999,000	999,213
Michigan	10,993,239		10,993,239	12,821,344		12,821,344
Minnesota	41,592,063	24,941,064	66,533,127	45,760,242	36,334,262	82,094,504
Missouri	2,700	415,454	418,154	19,169	567,965	587,134
Nevada	3,094		3,094	5,465		5,465
New Jersey	108,823	788,180	897,003	138,451	987,940	1,126,391
New Mexico				14,284		14,284
New York	116,488	5,973,867	6,090,355	126,488	6,591,792	6,718,280
Pennsylvania		1,447,313	1,447,313		1,750,115	1,750,115
Texas	6,668	1,438,977	1,445,645		2,599,723	2,599,723
Utah	2,698,632		2,698,632	3,111,167		3,111,167
Virginia		4,349	4,349		25,000	25,000
Wisconsin	1,405,775		1,405,775	1,701,619		1,701,619
Wyoming	539,554		539,554	491,906		491,906
Total	63,516,167	40,961,328	104,477,495	70,432,776	55,469,337	125,902,113
Percent of total	60.8	39.2	100.0	56.0	44.0	100.0

TABLE 5.—Iron ore mined in the United States, by mining districts and varieties, 1949–50, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

Variety of ore	Lake Superior district	Southeastern States	Northeastern States	Western States	Total
1949					
Crude ore:					
Hematite	79,112,113	6,811,252	3,810	1,491,533	87,418,708
Brown ore	[1] 146,936	4,673,298		1,448,345	6,268,579
Magnetite	[2] 47,000		8,400,965	2,715,484	11,163,449
Total	79,306,049	11,484,550	8,404,775	5,655,362	104,850,736
Usable iron ore:					
Hematite	68,376,209	6,666,644	1,796	1,217,928	76,262,577
Brown ore	[1] 102,158	935,178		508,259	1,545,595
Magnetite	15,756		3,862,037	2,715,484	6,593,277
Total	68,494,123	7,601,822	3,863,833	4,441,671	84,401,449
1950					
Crude ore:					
Hematite	95,896,122	6,599,500	4,227	1,892,271	104,392,120
Brown ore	[1] 478,985	5,310,200		2,617,223	8,406,408
Magnetite	[2] 186,000		9,571,561	3,183,389	12,940,950
Total	96,561,107	11,909,700	9,575,788	7,692,883	125,739,478
Usable iron ore:					
Hematite	79,229,737	6,427,223	1,725	1,499,275	87,157,960
Brown ore	[1] 335,470	1,080,285		1,199,647	2,615,402
Magnetite	62,087		4,473,109	3,161,833	7,697,029
Total	79,627,294	7,507,508	4,474,834	5,860,755	97,470,391

[1] Produced in Fillmore County; not in the true Lake Superior district.
[2] Approximate.

TABLE 6.—Iron ore produced in the United States, by States and types of product, 1949–50, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

State	1949					1950				
	Direct shipping ore	Sinter [1]	Concentrates	Total	Iron content natural (percent)	Direct shipping ore	Sinter [1]	Concentrates	Total	Iron content natural (percent)
Mined ore:										
Alabama	5, 522, 190	1, 143, 126	703, 468	7, 368, 784	36. 47	5, 297, 655	1, 127, 717	874, 372	7, 299, 744	37. 42
Arkansas								1, 444	1, 444	48. 00
California	536, 525			536, 525	55. 58	831, 445			831, 445	54. 15
Georgia			228, 689	228, 689	42. 10	213		202, 214	202, 427	37. 98
Michigan	11, 199, 024			11, 199, 024	53. 03	12, 691, 101			12, 691, 101	51. 28
Minnesota	41, 788, 857	260, 403	13, 812, 282	55, 861, 542	50. 25	45, 851, 046	253, 452	19, 130, 057	65, 234, 555	49. 37
Missouri	2, 700		141, 849	144, 549	51. 80	19, 169		174, 969	194, 138	55. 92
Nevada	3, 094			3, 094	65. 00	5, 465			5, 465	64. 59
New Jersey	108, 896		339, 915	448, 811	63. 01	138, 110		448, 237	586, 347	62. 16
New Mexico						14, 284			14, 284	53. 20
New York	116, 561	1, 932, 315	415, 170	2, 464, 046	62. 59	127, 364	2, 309, 780	335, 005	2, 772, 149	62. 35
Pennsylvania		622, 268	328, 708	950, 976	57. 73		637, 663	478, 675	1, 116, 338	57. 60
Texas	6, 668	60, 682	438, 209	505, 559	44. 55		21, 639	1, 160, 508	1, 182, 147	40. 89
Utah	2, 712, 390			2, 712, 390	53. 66	3, 139, 926			3, 139, 926	54. 41
Virginia			4, 349	4, 349	32. 00			5, 337	5, 337	32. 00
Wisconsin	1, 433, 557			1, 433, 557	52. 88	1, 701, 638			1, 701, 638	52. 90
Wyoming	539, 554			539, 554	49. 14	491, 906			491, 906	45. 70
Total mined ore	63, 970, 016	4, 018, 794	16, 412, 639	84, 401, 449	50. 06	70, 309, 322	4, 350, 251	22, 810, 818	97, 470, 391	49. 40
Byproduct ore: [2]										
Delaware					61. 95					62. 91
Tennessee		535, 998		535, 998	68. 40		574, 969		574, 969	68. 50
Virginia					57. 00					56. 50
Total byproduct ore		535, 998		535, 998	66. 10		574, 969		574, 969	65. 75
Grand total	63, 970, 016	4, 554, 792	16, 412, 639	84, 937, 447	50. 16	70, 309, 322	4, 925, 220	22, 810, 818	98, 045, 360	49. 49

[1] Exclusive of sinter produced at consuming plants.
[2] Cinder and sinter obtained from pyrites treated in, but not necessarily mined in, States indicated.

TABLE 7.—Iron ore produced in the United States, by States and varieties, 1949–50, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

State	1949				1950			
	Hematite	Brown ore	Magnetite	Total	Hematite	Brown ore	Magnetite	Total
Alabama	6,666,644	702,140		7,368,784	6,427,010	872,734		7,299,744
Arkansas							1,444	1,444
California	536,525			536,525	830,731		714	831,445
Georgia		228,689		228,689	213	202,214		202,427
Michigan	11,199,024			11,199,024	12,691,101			12,691,101
Minnesota	55,743,628	102,158	15,756	55,861,542	64,836,998	335,470	62,087	65,234,555
Missouri	141,849	2,700		144,549	176,638	17,500		194,138
Nevada			3,094	3,094			5,465	5,465
New Jersey			448,811	448,811			586,347	586,347
New Mexico							14,284	14,284
New York	1,796		2,462,250	2,464,046	1,725		2,770,424	2,772,149
Pennsylvania			950,976	950,976			1,116,338	1,116,338
Texas		505,559		505,559		1,182,147		1,182,147
Utah			2,712,390	2,712,390			3,139,926	3,139,926
Virginia		4,349		4,349		5,337		5,337
Wisconsin	1,433,557			1,433,557	1,701,638			1,701,638
Wyoming	539,554			539,554	491,906			491,906
Total	76,262,577	1,545,595	6,593,277	84,401,449	87,157,960	2,615,402	7,697,029	97,470,391
Byproduct ore: [1] Delaware, Tennessee, Virginia				535,998				574,969
Grand total	76,262,577	1,545,595	6,593,277	84,937,447	87,157,960	2,615,402	7,697,029	98,045,360

[1] Cinder and sinter obtained from pyrites treated in, but not necessarily mined in, States indicated.

TABLE 8.—Shipments of iron ore in the United States in 1950, by States and uses, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

	Iron and steel			Cement	Paint	Miscellaneous	Total	
	Direct shipping ore	Sinter [1]	Concentrates				Gross tons	Value
Mined ore:								
Alabama	5,392,735	1,127,463	881,806			204	7,402,208	$28,932,801
Arkansas			1,444				1,444	(2)
California	849,275					214	849,489	(2)
Georgia	213		202,214				202,427	677,248
Michigan	12,821,344						12,821,344	72,358,822
Minnesota	45,760,242	253,452	18,525,065				64,538,759	311,716,341
Missouri	19,169		174,969				194,138	(2)
Nevada	5,465						5,465	(2)
New Jersey	138,451		435,096	14,125	56	471	588,199	5,651,563
New Mexico	14,284						14,284	(2)
New York	126,488	2,302,185	395,555	3,764	1,725	87,540	2,917,257	27,914,818
Pennsylvania		637,663	478,675				1,116,338	11,626,216
Texas		22,328	1,162,430		4,657		1,189,415	(2)
Utah	3,105,423			3,034		2,710	3,111,167	5,746,808
Virginia					5,245		5,245	(2)
Wisconsin	1,701,619						1,701,619	(2)
Wyoming	491,906						491,906	(2)
Undistributed								18,733,513
Total	70,426,614	4,343,091	22,257,254	20,923	11,683	91,139	97,150,704	483,358,130
Byproduct ore: [3] Delaware, Tennessee, Virginia		613,706					613,706	4,632,274
Grand total	70,426,614	4,956,797	22,257,254	20,923	11,683	91,139	97,764,410	487,990,404

[1] Exclusive of sinter produced at consuming plants.
[2] Values that may not be shown separately are combined as "Undistributed."
[3] Cinder and sinter obtained from pyrites treated in, but not necessarily mined in, States indicated.

PRINCIPAL MINES

Table 9 lists, in descending order and with pertinent details, the iron mines of the United States that produced over 500,000 gross tons of crude ore each in 1950. The order of listing is based on ore tonnage, not iron content of product; thus mines producing low-grade crude ore that requires concentration are considered comparable in size to mines producing similar tonnages of direct-shipping ore.

Thirty-eight mines, each producing over 1,000,000 tons of ore, supplied 59 percent of the domestic output in 1950. In this group, a notable change is the loss of first position by the Hull-Rust pit, a position it held as early as 1913, though not every year since then. Of the 38 mines, 25 were in Minnesota, 5 in Alabama, 3 in New York, and 1 each in Michigan, Pennsylvania, Texas, Utah, and Wisconsin; 30 were open-pit mines, 6 underground, and 2 combined operations. Except for four mines producing magnetite, one producing semi-altered magnetite, and three producing brown ore, all of the million-ton mines produced hematite. In 1949, 36 million-ton mines produced 57 percent of the total output.

Forty-two mines, producing 500,000 to 1,000,000 tons of crude ore each, supplied 23 percent of the domestic output in 1950. Of these, 21 were in Minnesota, 11 in Michigan, 3 in Alabama, 2 in Utah, and 1 each in California, Missouri, New Jersey, New York, and Wisconsin. Eighty-two percent of the iron ore mined in the United States during 1950 came from the 80 mines listed in table 9.

TABLE 9.—Iron-ore mines in the United States in 1950, by size of crude output

Name of mine	State	Nearest town	Range or district	Mining method	Production (gross tons)	
					Crude ore	Usable ore
Sherman	Minnesota	Fraser	Mesabi	Open pit	5,830,710	5,819,277
Hull Rust	do	Hibbing	do	do	5,792,852	5,640,151
Rouchleau	do	Virginia	do	do	5,133,542	5,127,553
Mountain Iron	do	Mt. Iron	do	do	3,557,961	2,857,477
Benson	New York	Star Lake	Adirondack	do	2,913,157	1,018,679
Mahoning	Minnesota	Hibbing	Mesabi	do	2,640,478	2,640,478
Monroe [1]	do	Chisholm	do	do	2,471,402	2,471,402
Lone Star	Texas	Daingerfield	East Texas	do	2,242,196	893,550
Gross Marble	Minnesota	Marble	Mesabi	do	2,181,847	1,155,958
Walker	do	Coleraine	do	do	2,069,310	1,269,915
Gilbert	do	Gilbert	do	do	2,019,286	2,015,376
Spruce	do	Eveleth	do	Combined	1,929,554	1,929,554
Wenonah	Alabama	Bessemer	Birmingham	Underground	1,912,540	1,869,443
Hill-Trumbull	Minnesota	Marble	Mesabi	Open pit	1,850,787	616,491
Holman Cliffs [2]	do	Taconite	do	do	1,772,975	879,753
Cornwall-Lebanon concentrator	Pennsylvania	Lebanon	Cornwall	Combined	1,762,540	1,116,338
Iron Mountain	Utah	Cedar City	Iron Mountain	Open pit	1,668,897	1,668,897
Canisteo	Minnesota	Coleraine	Mesabi	do	1,589,208	760,480
Buckeye	do	do	do	do	1,547,670	757,390
Halobe	do	Nashwauk	do	do	1,530,475	494,869
Canton	do	Biwabik	do	do	1,506,026	1,505,202
New Bed Harmony and Old Bed	New York	Mineville	Adirondack	Underground	1,372,889	842,503
Scranton	Minnesota	Hibbing	Mesabi	Open pit	1,366,941	1,366,941
Hawkins	do	Nashwauk	do	do	1,339,430	672,986
Hill Annex	do	Calumet	do	do	1,314,386	751,682
Mather	Michigan	Ishpeming	Marquette	Underground	1,300,081	1,300,081
Bray [3]	Minnesota	Keewatin	Mesabi	Open pit	1,294,782	856,528
Argonne	do	Nashwauk	do	do	1,255,428	707,057
Ishkooda	Alabama	Bessemer	Birmingham	Underground	1,244,376	1,216,249
MacIntyre	New York	Tahawus	Adirondack	Open pit	1,222,939	495,608
Muscoda	Alabama	Bessemer	Birmingham	Underground	1,213,980	1,186,344
Embarrass	Minnesota	Biwabik	Mesabi	Open pit	1,201,503	1,201,503
Blackburn	Alabama	Russellville	Birmingham	do	1,200,000	245,644
Adkins	do	Woodstock	do	do	1,158,000	231,705
Montreal	Wisconsin	Montreal	Gogebic	Underground	1,094,793	1,094,793
South Agnew	Minnesota	Hibbing	Mesabi	Open pit	1,084,530	927,518
Patrick	do	Nashwauk	do	do	1,063,246	455,027
Longyear	do	Hibbing	do	do	1,047,765	984,586
Susquehanna	do	do	do	do	980,976	888,650
Arcturas	do	Marble	do	do	950,293	459,048
Pyne	Alabama	Bessemer	Birmingham	Underground	926,881	926,881
Kevin	Minnesota	Cooley	Mesabi	Open pit	901,120	280,549
Excelsior	Utah	Cedar City	Iron Mountain	do	874,263	874,263
Chateaugay	New York	Lyon Mountain	Adirondack	Combined	869,625	251,046
Eagle Mountain	California	Desert Center	Eagle Mountain	Open pit	830,731	830,731
Danube	Minnesota	Bovey	Mesabi	do	809,617	530,847
Columbia	do	Virginia	do	do	805,787	789,676

Portsmouth	Minnesota	Crosby	Cuyuna	Open pit	804, 350	614, 594
Mary Ellen	do	Biwabik	Mesabi	do	799, 614	404, 835
Duncan	do	Hibbing	do	do	722, 676	585, 397
Bennett	do	Keewatin	do	Combined	707, 368	595, 555
Olson	do	Nashwauk	do	Open pit	694, 825	305, 810
Fayal	do	Eveleth	do	Combined	683, 925	683, 925
Pioneer	do	Ely	Vermilion	Underground	678, 867	678, 867
Warner-Auxford	Alabama	Russellville	Birmingham	Open pit	650, 000	130, 766
Geneva	Michigan	Ironwood	Gogebic	Underground	645, 972	645, 972
Cliffs Shaft	do	Ishpeming	Marquette	do	641, 562	641, 562
Maas	do	Negaunee	do	do	633, 444	633, 444
North Harrison	Minnesota	Nashwauk	Mesabi	Open pit	625, 179	234, 152
Athens	Michigan	Negaunee	Marquette	Underground	612, 000	612, 000
Cary	Wisconsin	Hurley	Gogebic	do	606, 845	606, 845
Grant	Minnesota	Buhl	Mesabi	Open pit	605, 207	363, 183
Webb	do	Hibbing	do	do	602, 419	523, 150
Russellville No. 14	Alabama	Russellville	Birmingham	do	600, 000	122, 249
Anvil-Palms-Keweenaw	Michigan	Bessemer	Gogebic	Underground	597, 202	597, 202
Galbraith	Minnesota	Nashwauk	Mesabi	Open pit	593, 000	314, 281
Charleson concentrator	do	Virginia	do	do	588, 114	189, 263
Hiawatha	Michigan	Iron River	Menominee	Underground	585, 813	585, 813
Wauseca	do	do	do	do	585, 766	585, 766
Godfrey	Minnesota	Chisholm	Mesabi	do	574, 361	574, 361
Feigh	do	Ironton	Cuyuna	Open pit	572, 561	511, 682
Section 18	do	Hibbing	Mesabi	do	572, 437	495, 588
Iron Mountain	Missouri	Iron Mountain	Iron Mountain	do	567, 965	174, 969
Scrub Oaks	New Jersey	Dover	N. J. & SE. N. Y	Underground	562, 057	204, 400
Newport	Michigan	Ironwood	Gogebic	do	559, 039	559, 039
Blowout	Utah	Cedar City	Iron Mountain	Open pit	551, 710	551, 710
Penokee	Michigan	Ironwood	Gogebic	Underground	521, 441	521, 441
Homer-Minckler-Cardiff	do	Iron River	Menominee	do	514, 715	514, 715
Sunday Lake	do	Wakefield	Gogebic	do	512, 960	512, 960
South Longyear	Minnesota	Hibbing	Mesabi	Open pit	507, 353	394, 901
Output of 80 mines producing more than 500,000 tons of crude ore each					102, 928, 522	78, 547, 076
Output of 9 mines producing 400,000 to 500,000 tons of crude ore each					4, 057, 294	3, 673, 605
Output of 16 mines producing 300,000 to 400,000 tons of crude ore each					5, 701, 208	4, 811, 806
Output of 29 mines producing 200,000 to 300,000 tons of crude ore each					6, 814, 135	5, 618, 314
Output of 30 mines producing 100,000 to 200,000 tons of crude ore each					4, 189, 981	3, 153, 596
Output of 17 mines producing 50,000 to 100,000 tons of crude ore each					1, 220, 743	1, 048, 166
Output of 66 mines producing under 50,000 tons of crude ore each					827, 595	617, 828
Grand total United States (247 mines)					125, 739, 478	97, 470, 391

[1] Shown as Monroe-Tener in 1949.
[2] Shown as Holman-Brown in 1949.
[3] Shown as Mississippi in 1949.

SINTER

Domestic production of sinter for consumption in iron and steel furnaces during 1950 totaled 18,740,217 gross tons, a 22-percent increase above the 15,374,026 tons produced in 1949. Iron-bearing materials required were 14,124,504 tons of iron ore, 16,440 tons of manganiferous ore, 5,887,721 tons of flue dust, 448,329 tons of mill cinder and roll scale, and 663,101 tons of pyrites cinder. The total 21,140,095 tons, resulted in a conversion yield of 89 percent. Sintering plants at mines in 5 States produced 4,350,251 tons—23 percent of the total; and plants at blast-furnaces and custom mills in 14 States produced 14,389,966 tons or 77 percent.

TABLE 10.—Production and consumption of sinter in the United States in 1950, by States, in gross tons

State	Sinter produced	Sinter consumed—	
		In blast furnaces	In steel furnaces
Alabama	1,544,882	1,809,343	80,058
California, Colorado, Utah	1,476,052	1,456,514	
Delaware	132,609		
Illinois	748,477	764,591	38,778
Indiana	1,353,863	1,068,649	280,462
Maryland			
Kentucky, Tennessee, West Virginia	482,898		
Maryland, Kentucky, Tennessee, West Virginia		639,648	75,783
Michigan	427,021	425,544	
Minnesota	253,452		
New York	3,515,596	1,130,852	64,590
Ohio	3,209,416	3,253,996	395,283
Pennsylvania	5,574,312	6,184,188	235,109
Texas	21,639	22,329	
Total	18,740,217	16,755,654	1,170,063

REVIEW OF LAKE SUPERIOR DISTRICT

Production and Shipments.—Active mines and mills in the Lake Superior district reported 79,291,824, gross tons of usable iron ore (containing less than 5 percent manganese) produced during 1950, an increase of 16 percent above 1949, but 4 percent below 1948. The six iron ranges—the Marquette, Menominee, Gogebic, Vermilion, Mesabi, and Cuyuna—supplied 81 percent of all domestic output with 62 percent supplied by the Mesabi range alone. These proportions are almost identical with 1949. In addition, 335,470 tons of brown ore were produced in Fillmore County, Minn., which is not considered part of the true Lake Superior district, another 928,260 tons of ore containing (natural) 5 percent or more manganese were also produced in the district. Including these tonnages, output for the district, all grades, totaled 80,555,554 tons. Shipments from the district totaled 79,928,910 tons, of which 79,607,239 tons (including 867,188 tons of manganiferous ore) came from the six ranges and 321,671 tons from Fillmore County, Minn.

The Lake Superior Iron Ore Association reported 76,274,059 gross tons of iron and manganiferous ores shipped to upper Lake ports from United States mines in 1950, an increase of 12 percent over

1949. All-rail shipments, which included, for the first time, ore to Pittsburgh, Pa., were 3,686,182 tons compared with 1,428,416 tons in 1949.

Canadian mines in the Lake Superior region include those in the Michipicoten and Atikokan districts. Shipments from these mines in 1950 (not included in the above statistics) totaled 2,174,726 gross tons. Of this quantity, 958,113 tons came from the Helen mine in the Michipicoten district and 1,216,613 tons from Steep Rock mines in the Atikokan district.

The Great Lakes shipping season had considerable difficulty getting under way in 1950. Cold weather persisted into mid-May, although ore carriers had been fighting their passage through ice at irregular intervals since April 19, when the steamer *Sullivan Brothers* of the Gartland Steamship Co., left Escanaba, Mich., with the year's first cargo of iron ore. A group of seven ore carriers, which remained in the Duluth-Superior harbor during the winter, were escorted by the ice breaker *Mackinaw* to Two Harbors, where they were loaded and sent out on April 28. These were the first cargoes to depart upper Lake ports in 1950. However, there was much discussion as to just when the season was opened officially. Another 2 weeks passed before ice had cleared enough to permit full-scale shipping. In order to transport enough ore to meet the high demand for current consumption and to build up stockpiles for the 1950–51 winter, ore carriers continued in operation until mid-December. Final departures were the steamers *Benson Ford* and *Henry Ford* from Marquette, Mich., on December 14. All-rail shipments, the bulk of which normally go to furnaces in Duluth, Minn., and Granite City, Ill., were greatly increased when it was decided to supplement water-transported ore with rail shipments to lower Lake consuming centers. The movement was initiated in July and continued until freezing weather made it impracticable to unload the ore. At the end of the year, shipments were resumed, and small quantities of calcium chloride were used to retard freezing in the cars.

The 1950 shipping season emphasized the need for increased ore-transportation capacity. Moreover, the outbreak of hostilities in Korea and the rearmament program made it clear that industry would necessarily depend on large tonnages of Lake Superior ores for many years to come. It was apparent also that industry would need large quantities of ore produced from taconite in addition to the expected increase of imported ore. Therefore, anticipating an increase in concentrates to offset the decline in available direct-shipping ore, the shipping companies placed orders for a number of new vessels. These larger and faster vessels are well typified by the new *S. S. Wilfred Sykes* of Inland Steel's fleet. This ship entered service at the beginning of the season between upper Lake ports and Indiana Harbor, Ind. She is 678 feet long over-all and has a 70-foot beam. Bulk cargo capacity is 21,500 gross tons, and rated speed 17–18 knots loaded.

TABLE 11.—Iron ore produced in the Lake Superior district, 1854–1950, by ranges, in gross tons

[Exclusive after 1905 of ore containing 5 percent or more manganese]

Year	Marquette	Menominee	Gogebic	Vermilion	Mesabi	Cuyuna	Total
1854–1944	229, 773, 915	205, 736, 670	242, 702, 380	75, 704, 578	1, 376, 030, 818	32, 807, 310	2, 162, 755, 671
1945	4, 664, 816	4, 140, 239	4, 395, 653	1, 481, 007	58, 355, 320	1, 784, 010	74, 821, 045
1946	3, 455, 961	2, 662, 308	3, 633, 078	1, 232, 008	46, 678, 679	1, 380, 120	59, 042, 154
1947	5, 070, 631	3, 741, 217	5, 227, 005	1, 471, 879	58, 772, 404	2, 100, 846	76, 383, 982
1948	4, 830, 341	4, 259, 378	5, 504, 971	1, 580, 497	64, 071, 983	2, 030, 281	82, 277, 451
1949	4, 392, 732	3, 483, 375	4, 756, 474	1, 381, 327	52, 551, 346	1, 826, 711	68, 391, 965
1950	5, 085, 500	4, 068, 458	5, 238, 781	1, 580, 217	60, 838, 025	2, 480, 843	79, 291, 824
Total	257, 273, 896	228, 091, 645	271, 458, 342	84, 431, 513	1, 717, 298, 575	44, 410, 121	2, 602, 964, 092

Technologic Trends and Operating Methods.—In order to produce increasing quantities of iron ore without a prohibitive increase in manpower, it has been necessary for the industry to develop labor-saving equipment. Moving the ore has always been the phase of operations most amenable to such mechanization, and the important trends have been toward greater transportation efficiency. Belt conveyors have proved extremely efficient when quantity of material and distance involved can be effectively balanced against cost of installation. Belt conveyors are installed in underground mines, open pits, and mills and on stockpiles and loading docks; it has even been proposed to install one from Lake Erie ports to the Pittsburgh area. Trucks are necessary where the terminals are temporary, and the trend in recent years has been toward Diesel-powered giants up to 550 horsepower. These trucks were discussed by Burton.[1]

An important trend counteractive to the manpower saved by mechanization is the increasing proportion of material that requires treatment before it goes to the furnaces. The plants for this purpose are becoming larger and more complex as leaner ores are yielding to profitable beneficiation. The projected expansion for treatment of taconite suggests the possibility of vastly increased use of manpower in the large mills that will be required to produce significant quantities of taconite concentrates.

Analyses.—Table 12 shows average analyses of all ore shipped from the Lake Superior district during the past 5 years. Although the average grade of the ore has gradually declined, it is anticipated that increasing quantities of high-grade concentrates will eventually halt the downward trend.

Reserves.—Tables 13 and 14 show reserves of iron ore in Michigan and Minnesota, by ranges. It should be borne in mind that these data represent only taxable and State-owned reserves and not the total that may be expected to become available. Tonnages are added to the reserve figures each year, and undoubtedly eventual production in the Lake Superior district will greatly exceed that indicated by present reserve tonnages.

[1] Burton, C. R., Power Plants for Production on the Mesabi Range: Skillings' Mining Review, vol. 39, No. 32, Nov. 18, 1950.

TABLE 12.—Average analyses of total tonnages (bill-of-lading weights) of all grades of iron ore from all ranges of Lake Superior district, 1946–50

[Lake Superior Iron Ore Association]

Year	Gross tons	Content (natural), percent				
		Iron	Phosphorus	Silica	Manganese	Moisture
1946	58,975,188	51.32	0.087	8.83	0.74	11.22
1947	77,210,278	50.91	.093	9.09	.75	11.28
1948	82,655,757	50.49	.093	9.30	.76	11.35
1949	68,531,664	50.39	.096	9.72	.78	11.12
1950	79,150,079	50.38	.092	9.85	.77	11.11

TABLE 13.—Iron-ore reserves in Michigan, Jan. 1, 1947–51, in gross tons

[Michigan Department of Conservation]

Range	1947	1948	1949	1950	1951
Gogebic	31,331,775	31,937,142	30,511,502	29,098,914	33,466,792
Marquette	62,228,925	66,636,928	67,101,475	65,109,601	68,323,382
Menominee	49,298,678	51,462,819	55,913,371	55,594,843	60,136,726
Total Michigan	142,859,378	150,036,889	153,526,348	149,803,358	161,926,900

TABLE 14.—Unmined iron-ore reserves in Minnesota, May 1, 1946–50, in gross tons

[Minnesota Department of Taxation]

	1946	1947	1948	1949	1950
Mesabi	924,903,098	922,401,348	915,220,248	900,959,665	912,226,039
Vermilion	11,523,341	10,699,576	10,435,800	12,196,016	12,498,639
Cuyuna	59,061,587	55,756,200	38,040,129	37,308,274	42,977,068
Total Lake Superior district (taxable)	995,488,026	988,857,124	963,696,177	950,463,955	967,701,746
Fillmore County		186,700	394,248	547,744	582,820
Morrison County					88,286
State ore (not taxable)	19,950,255	11,600,524	3,515,084	2,435,729	2,642,853
Total Minnesota	1,015,438,281	1,000,644,348	967,605,509	953,447,428	971,015,705

MINING BY STATES

Alabama.—In contrast to other iron-mining States, Alabama was the only major producer that failed to make a substantial gain over 1949. Production decreased 1 percent, and shipments increased 1 percent. Operations in 1950 were not entirely free of labor disputes, but no production losses were sustained comparable with those of the 1949 steel strike.

The steel industry of the Birmingham district is supported principally by red-ore mines just outside of the city. One group, the Wenonah, Ishkooda, and Muscoda mines of the Tennessee, Coal, Iron & Railroad Co., was undergoing mechanization during 1950, with a view toward expanded production despite the difficulties involved in a 2-mile haul from the ore face to the surface. Other active red-ore mines in Jefferson County included the Ruffner and Sloss mines, Sloss-Sheffield Steel & Iron Co.; the Edwards and Spaulding mines, Republic Steel Corp.; and the Pyne and Songo mines, Woodward Iron Co. These nine mines supplied 87 percent of the total

Alabama output in 1950. The larger brown-ore mines included the Russellville No. 14 mine, Sloss-Sheffield Steel & Iron Co., and the Blackburn, Adkins, and Warner mines, Shook & Fletcher Supply Co. These 4 mines supplied 11 percent of the Alabama total, the remaining 2 percent being supplied by 22 small brown-ore operations and 2 red-ore mines.

The Alabama mining industry was described comprehensively by several authors in a special Birmingham issue of Mining Engineering.[2]

Arkansas.—The Magnet Iron Co., Little Rock, Ark., shipped magnetite concentrates from its mine near Butterfield to furnaces in the Birmingham district.

California.—The only major producer in California, Kaiser Steel Corp., shipped a mixed hematite and magnetite from its Eagle Mountain mine in Riverside County and hematite from its Vulcan mine in San Bernardino County. This latter mine did not produce, but shipped the remainder of a stockpile. The Bessemer mine in San Bernardino County, operated by Edward Hedstrom, shipped small quantities of magnetite to west coast steel furnaces.

Georgia.—Although reported iron-ore production in 1950 was 11 percent below 1949, considerable activity developed in the latter half of the year in anticipation of higher prices and a stronger demand for Georgia brown ore. Reserves of brown ore have not been accurately determined, but it is generally agreed that a significant tonnage can be extracted from these deposits over a period of years. The deposits are in the northwestern part of the State, and those in production during 1950 were in Bartow, Cherokee, and Polk Counties. A small shipment of red ore came from Walker County.

Kentucky.—Oolitic hematite deposits of the Rose Run area, Bath County, Ky., were described.[3]

Michigan and Minnesota.—*See* Review of the Lake Superior District.

Missouri.—The Iron Mountain mine of the Ozark Ore Co. produced hematite concentrates averaging 52.02 percent iron (natural) during 1950. Operations in the open pit are declining, and preparations are being made for underground mining. Beneficiation consists of crushing and jigging. Untreated brown ore from a number of small open pits in Wayne County were shipped by Doane & Ives, and a small tonnage of high-grade lump and direct-shipping hematite was shipped from the Christy mine in Crawford County, operated by the Missouri Mining Co.

Nevada.—Segerstrom & Heizer continued to ship small tonnages of high-grade ore from mines near Lovelock.

New Jersey.—The four underground mines producing magnetite lump and concentrates from New Jersey mines increased their 1950 output 31 percent over 1949. The Scrub Oaks and Washington mines, Alan Wood Steel Co., the Mount Hope mine, Warren Foundry & Pipe Corp., and the Richard mine, Richard Ore Co., continued to be the only active producers in New Jersey. Average iron content was 62.16 percent (natural). Small percentages of the ore were consumed in making cement and for miscellaneous uses. A description of iron mining in New Jersey was published.[4]

---

[2] Mining Engineering, vol. 187, No. 12, December 1950, pp. 1213–1250D.

[3] Muir, Neal M., Investigation of the Rose Run Iron Area, Bath County, Ky.: Bureau of Mines Rept. of Investigations 4650, 1950, 93 pp.

[4] Skillings, David N., Four Mines Maintain Iron-Ore Production Front for New Jersey; Skillings' Mining Review, vol. 39, Dec. 9, 1950.

New Mexico.—The Hanover-Bessemer mine in Grant County produced direct-shipping magnetite averaging 54.4 percent iron. Iron deposits in New Mexico were described.[5]

New York.—The Adirondack region increased iron-ore output in 1950, 13 percent over 1949. Virtually all production was magnetite, 63 percent of which came from open-pit mines. Of the usable ore produced, 5 percent was open-hearth lump ore, 83 percent sintered concentrates, and 12 percent unsintered concentrates. The average iron content was 62.35 percent.

Active mines included the Chateaugay, open pit and underground; the New Bed-Harmony-Old Bed, underground; and Fisher Hill, underground, all operated by Republic Steel Corp.; the Benson, open pit, Jones & Laughlin Steel Corp.; Clifton, underground, Hanna Coal & Ore Corp.; MacIntyre mine, open pit, National Lead Co.; and the underground hematite mine of the Clinton Metallic Paint Co.

Pennsylvania.—The Cornwall mine and Lebanon concentrator of Bethlehem Steel Co. increased output of usable concentrates and sinter 17 percent over 1949. Sinter comprised 57 percent of the total, and the average iron content of the usable product was 57.6 percent. The company was exploring eastern Pennsylvania during 1950 for additional deposits and, on the basis of air-borne-magnetometer surveys, began diamond drilling in Berks County for iron deposits not indicated on the surface.

Texas.—The iron-ore output of Texas in 1950 came from three mines, which together produced over a million tons of usable product for the first time. All were open-pit, brown-ore mines producing washed concentrates in Cass, Cherokee, and Morris Counties in east Texas.

Utah.—A 16-percent increase in Utah iron-ore output during 1950 brought the total above the 3-million-ton level and approached the record high of 3,233,413 tons in 1948. All production was in Iron County and came from the Blowout and Duncan mines, Colorado Fuel & Iron Corp.; the Excelsior mine, Utah Construction Co.; the Iron Mountain mine, Columbia Iron Mining Co.; and the Great Western mine of Helene E. Beatty. Average iron content of the semialtered magnetite was 54.41 percent.

Development and exploration was underway in the Bull Valley district of Washington County.[6] Results of magnetometer surveys in Iron County were published.[7]

Virginia.—Iron ore production in Virginia during 1950 was confined to Pulaski County, where a small quantity of brown ore was shipped for use in making paint.

Washington.—A contract has been let for the completion of a road from the Buckhorn Mountain iron mine to Chesaw.[8]

Wisconsin.—*See* Review of the Lake Superior District.

Wyoming.—Colorado Fuel & Iron Corp. continued to produce hematite from its underground Sunrise mine in Platte County. Output in 1950 averaged 45.7 percent iron content.

---

[5] Kelley, V. C., Geology and Economics of New Mexico Iron-Ore Deposits: Prep. in coop. with Geological Survey, U. S. Department of the Interior. University of New Mexico Press, Alberquerque 1950, 246 pp.

[6] Mining World, vol. 12, No. 7, June 1950, p. 65.

[7] Cook, Kenneth L., Magnetic Surveys in the Iron Springs District, Iron County, Utah: Bureau of Mines Rept. of Investigations 4586, 1950, 78 pp.

[8] Engineering and Mining Journal, vol. 151, No. 4, April 1950, p. 146.

TABLE 15.—Iron ore mined in the United States in 1950, by States and counties, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

State and county	Active mines	Crude ore	Usable ore
Alabama:			
Bibb	1	1,158,000	231,705
Calhoun	9	376,300	79,284
Cherokee	5	116,400	23,491
Franklin	6	2,472,200	503,295
Jefferson	11	6,599,287	6,427,010
Shelby	1	60,000	11,585
Talladega	4	103,300	23,374
Total	[1] 37	10,885,487	7,299,744
Arkansas: Hot Springs	1	23,000	1,444
California:			
Riverside	1	830,731	830,731
San Bernardino	1	714	714
Total	2	831,445	831,445
Georgia:			
Bartow	2	164,000	32,377
Cherokee	2	253,000	52,342
Polk	6	582,000	117,495
Walker	1	213	213
Total	[1] 11	999,213	202,427
Michigan:			
Dickinson	2	84,692	84,692
Gogebic	9	3,647,193	3,647,193
Iron	11	3,873,716	3,873,716
Marquette	15	5,085,500	5,085,500
Total	37	12,691,101	12,691,101
Minnesota:			
Crow Wing	13	3,202,744	2,480,843
Fillmore	1	478,985	335,470
Itasca	32	24,811,554	12,648,135
Morrison	1		
St. Louis	83	53,675,085	49,770,107
Total	130	82,168,368	65,234,555
Missouri:			
Crawford	1	1,669	1,669
St. Francis	1	567,965	174,969
Wayne	1	17,500	17,500
Total	3	587,134	194,138
Nevada: Pershing	1	5,465	5,465
New Jersey:			
Morris	3	1,090,826	586,347
Warren	1		
Total	4	1,090,826	586,347
New Mexico: Grant	1	14,284	14,284
New York:			
Clinton	1	3,571,215	1,601,026
Essex	3		
Oneida	1		
St. Lawrence	2	3,151,207	1,171,123
Total	7	6,722,422	2,772,149
Pennsylvania: Lebanon	1	1,762,540	1,116,338
Texas:			
Cass	1	2,599,723	1,182,147
Cherokee	1		
Morris	1		
Total	3	2,599,723	1,182,147
Utah: Iron	5	3,139,926	3,139,926
Virginia: Pulaski	1	25,000	5,337
Wisconsin: Iron	2	1,701,638	1,701,638
Wyoming: Platte	1	491,906	491,906
Grand total	247	125,739,478	97,470,391

[1] Excludes undetermined number of small pits. Estimated output of these mines included in tonnage given.

CONSUMPTION

Consumers of iron ore reported 106,610,273 gross tons used during 1950 (an increase of 19 percent above 1949), the highest annual total ever recorded. Blast furnaces consumed 82 percent, sintering plants 13 percent, steel furnaces 4 percent, and ferro-alloy furnaces, cement plants, pigment, and other items 1 percent in all. The iron ore consumed by sintering plants eventually went into blast furnaces and steel furnaces. Production and consumption of sinter is given in table 10 and consumption of iron ore in table 16.

TABLE 16.—Consumption of iron ore in the United States in 1950, by States and uses, in gross tons

[Exclusive of ore containing 5 percent or more manganese]

State	Metallurgical uses				Miscellaneous uses			Total [1]
	Iron blast furnaces	Steel furnaces	Sintering plants	Ferro-alloy furnaces	Cement	Paint	Other	
Alabama	6,992,543	46,221	1,499,014	2,253	69,910		204	8,610,145
California					33,881	3,418	214	
Colorado	2,464,563	339,146	1,564,060		(2)			4,405,282
Utah					(2)		(2)	
Illinois	9,508,847	364,024	275,832		366	(2)		10,149,069
Indiana	11,126,927	558,153	717,221					12,402,301
Kentucky	1,103,259	45,242						1,148,501
Maryland					(2)	(2)		
Massachusetts	7,577,823	742,985	285,103					8,605,911
Michigan								
Minnesota	1,086,230	91,749	325,941		(2)			1,503,920
New Jersey						(2)	(2)	(2)
New York	5,379,233	346,496	3,141,591	90,795	(2)	(2)	(2)	8,958,115
Ohio	16,273,337	612,385	2,489,759	153,583	3,332	(2)		19,532,396
Pennsylvania	21,863,855	1,567,298	3,866,374	1,066	(2)	53,310		27,351,903
Tennessee	9,530		85,000		11,458			105,988
Texas	1,350,343	200	26,286		28,804			1,405,633
Virginia					(2)	(2)		(2)
West Virginia	2,184,978	13,736			(2)			2,198,714
Undistributed [3]					82,995	58,679	90,721	232,395
Total	86,921,468	4,727,635	14,276,181	247,697	230,746	115,407	91,139	106,610,273

[1] State totals include only tonnages shown. Other tonnages included with "Undistributed."
[2] Included with "Undistributed."
[3] Includes States indicated by footnote 2 plus the following: For cement, Arkansas, Arizona, Florida, Georgia, Idaho, Kansas, Louisiana, Maine, Missouri, Montana, Nebraska, Oklahoma, Oregon, South Carolina, South Dakota, Washington, and Wyoming; and for paint, Georgia, North Dakota, and Wisconsin.

STOCKS

Stocks of usable iron ore at mines on December 31, 1950, are given in table 17. Total stocks at the end of 1950 were 7 percent above 1949. Minnesota mines held the largest stocks—41 percent of the total, Michigan followed with 33 percent, and New York was the third largest holder with 20 percent. Including Wisconsin, the Lake Superior district held 76 percent of all mine stocks. Crude-ore stocks at mines were 3,199,045 tons on December 31, 1950, compared with 3,335,095 tons at the end of 1949. Consuming plants held stocks of iron ore and sinter totaling 34,917,950 gross tons at the end of 1950, 6 percent lower than 1949.

Stocks at Lake Erie Ports.—On December 1, 1950, 2 weeks before navigation closed for the season, the Lake Superior Iron Ore Association reported 4,623,561 gross tons of iron ore on Lake Erie docks, compared with 6,938,595 tons in 1949. By the opening of the 1951 season (May 1, 1951), 1,813,434 tons were in stock compared with 3,065,827 tons in 1950. The 2,810,127 tons withdrawn from these stocks during the 1950–51 closed season were 27 percent less than during the preceding winter, but diminution was 61 percent in 1950–51 as compared with 56 percent during 1949–50.

TABLE 17.—Stocks of usable iron ore at mines, Dec. 31, 1949–50, by States, in gross tons

State	1949	1950	State	1949	1950
Alabama	157,073	54,609	Pennsylvania	5,357	5,357
California	106,282	91,346	Texas	61,400	54,132
Michigan	2,005,255	1,876,036	Utah	31,701	60,459
Minnesota	1,561,328	2,324,731	Virginia	-----	576
New Jersey	1,852	-----	Wisconsin	124,867	124,886
New York	1,278,545	1,133,437	Total	5,333,660	5,725,569

PRICES[9]

The average value per gross ton of iron ore f. o. b. mines and mills was $4.99 in 1950 compared with $4.50 in 1949, and $3.91 in 1948. Table 18 gives the average value at mines of the different types of product and varieties of ore for each of the producing States, except where there are fewer than three shippers of a certain class of ore in a State and where permission has not been given to publish the value. These data are taken directly from statements of producers and probably represent the commercial selling prices only approximately. In general, the delivered cost is given less transportation costs to the consuming plant. In the Lake Superior district the mine value is the Lake Erie price less freight from mines to lower Lake ports. This value appears to be applied also to ore that is not sold on the open market.

TABLE 18.—Average value per gross ton of iron ore at mines in the United States, 1949–50

[Exclusive of ore containing 5 percent or more manganese]

State	1949							1950						
	Direct			Concentrates				Direct			Concentrates			
	Hematite	Brown ore	Magnetite	Hematite	Brown ore	Magnetite	Sinter	Hematite	Brown ore	Magnetite	Hematite	Brown ore	Magnetite	Sinter
Mined ore:														
Alabama	$3.48	-----	-----	-----	$3.75	-----	(1)	$3.88	-----	-----	-----	$3.11	-----	(1)
Georgia	-----	-----	-----	-----	3.03	-----	-----	(1)	-----	-----	-----	3.34	-----	-----
Michigan	5.02	-----	-----	-----	-----	-----	-----	5.64	-----	-----	-----	-----	-----	-----
Minnesota	4.21	-----	-----	$4.51	(1)	(1)	(1)	4.72	-----	-----	$5.09	(1)	(1)	(1)
New Jersey	-----	-----	(1)	-----	-----	$9.90	-----	-----	-----	(1)	-----	-----	$9.32	-----
New York	(1)	-----	(1)	(1)	-----	7.70	$9.81	-----	-----	(1)	(1)	-----	7.50	$10.04
Pennsylvania	-----	-----	(1)	-----	-----	(1)	10.62	-----	-----	-----	-----	-----	(1)	11.38
Utah	-----	-----	$1.63	-----	-----	-----	-----	-----	-----	$1.85	-----	-----	-----	-----
Other States [2]	4.10	$2.47	7.03	7.59	4.38	-----	(1)	4.44	$3.50	3.19	7.92	3.09	3.23	(1)
Average, all States	4.29	2.47	2.21	4.59	3.91	7.87	8.21	4.82	3.50	2.47	5.12	3.42	8.54	8.52
Byproduct ore: [3]														
Delaware, Tennessee, Virginia	-----	-----	-----	-----	-----	-----	7.56	-----	-----	-----	-----	-----	-----	7.55

[1] Included with average for all States.
[2] Includes California, Arkansas, Missouri, Nevada, New Mexico, Texas, Virginia, Wisconsin, and Wyoming.
[3] Cinder and sinter obtained from pyrites treated in, but not necessarily mined in, States indicated.

[9] For an explanation of the factors affecting the price of iron ore, *see* Minerals Yearbook, 1948, p. 647.

Prices of Lake Superior Iron Ore.—Lake Erie base prices for Lake Superior iron ores were effective January 26, 1950, for the 1950 season. Each ore classification carried a 50-cent-per-ton increase over 1949; quotations were as follows: Old Range Bessemer, $8.10; Old Range non-Bessemer, $7.95; Mesabi Bessemer, $7.85; Mesabi non-Bessemer, $7.70; High-Phosphorus, $7.70.[10] Prices for 1951 were effective December 2, 1950, indicating a further increase of 60 cents per ton for each of the basic grades.[11] These prices are for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content with 0.045 percent (max.) phosphorus (dry), for Bessemer grades. Above 0.18 percent, the ores are classed as High-Phosphorus. Premiums and penalties are applied for variations in the analyses and physical structure.

Freight Rates.—Upper Lake freight rates remained at those effective May 6, 1949—$1.05 per gross ton from Minnesota ranges to upper Lake ports, including $0.13 per ton dock handling charge. Vessel rates were $1.45 per ton plus $0.20 unloading charge, effective September 1, 1949. Lower Lake rail freight rates from Lake Erie ports to the Pittsburgh and Wheeling district were $1.76 per ton plus $0.13 loading charge, effective September 2, 1949. Thus, total transportation charges f. o. b. cars at the Mesabi range to furnaces in Pittsburgh were $4.59 per gross ton, to which must be added the Federal transportation tax of 3 percent where applicable. Average value of iron ore shipped from the Mesabi range in 1950 was $4.80 per gross ton. By adding transportation charges and transportation tax to this figure, a calculated average value of $9.52 per gross ton of Mesabi ore at Pittsburgh is obtained. All-rail freight rates from the Mesabi range to Pittsburgh were $5.63 per ton, effective September 1, 1949, indicating that rail-transported ore had a calculated average value of $10.60 including $0.17 transportation tax.

Additional details on transportation costs were published.[12]

FOREIGN TRADE [13]

Tables 19 and 20 list the origin, tonnage, and value of iron ore imported and exported during 1948–50. The upward trend in the importation of iron ore continued in 1950, with an 11-percent increase over 1949, notwithstanding the fact that much-publicized new sources in Canada, Liberia, and Venezuela had not begun shipments. Chile was again the leading source but failed to equal the 1949 tonnage. Sweden was the second-largest source, with a total only slightly above 1949. Canada continued to import more iron ore from the United States than it shipped to the United States. All other sources supplied less than 1 million tons each but together accounted for 77 percent of the total increase over 1949. Brazil nearly doubled the tonnage supplied in 1949 and alone accounted for 41 percent of the increase. Except for 26 tons, all exports of iron ore in 1950 went to Canada. Japan, an important purchaser in 1949, received none.

[10] Steel Magazine, Market Summary: Vol. 126, No. 5, Jan. 30, 1950, p. 91.
[11] Steel Magazine, Market Summary: Vol. 127, No. 26, Dec. 25, 1950, p. 89.
[12] Wade, H. H., Mining Directory of Minnesota, 1950: Mines Exp. Sta. Bull., vol. 53, No. 23, May 1, 1950, p. 259.
[13] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 19.—Iron ore imported for consumption in the United States, 1948–50, by countries, in gross tons

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Algeria	405,224	$2,066,463	415,501	$2,349,746	494,342	$2,917,910
Argentina			20	24,809		
Belgium-Luxembourg	[1] 2	[1] 88				
Brazil	295,926	1,524,539	[2] 351,134	[2] 2,281,797	691,579	4,634,636
British West Africa	18,528	171,199	59,548	395,034	192,669	1,615,728
Canada [1]	985,846	5,838,645	[2] 1,623,391	[2] 10,769,802	1,859,199	12,735,464
Chile	2,631,997	7,526,640	2,627,007	6,891,016	2,569,980	6,726,085
Cuba	34,500	101,775	11,589	24,763	29,000	61,770
Egypt			7,500	88,650		
France	9,041	63,302			500	1,550
French Morocco	8,690	60,830				
Iran	3,000	162,000	1,500	90,000	3,000	180,000
Italy	[1] 9,451	[1] 64,948				
Liberia	4	85	30	105	(3)	51
Mexico	163,149	334,447	169,823	284,557	190,958	475,299
Netherlands			7,114	64,026		
Norway	108,616	634,602				
Philippines	4,160	28,880	5,250	51,816	3,600	36,000
Spain	6,449	66,825	9,200	78,658		
Spanish Africa	8,500	48,875			39,680	282,140
Sweden	1,358,962	8,317,362	[2] 2,027,155	[2] 12,893,385	2,037,249	13,461,540
Tunisia	56,358	297,748	82,815	424,076	119,093	608,377
United Kingdom	351	21,229	302	22,895	751	27,050
Total	6,108,754	27,330,482	[2] 7,398,879	[2] 36,735,135	8,231,600	43,763,600

[1] Includes pyrites cinder.
[2] Revised figure.
[3] Less than 0.5 ton.

TABLE 20.—Iron ore exported from the United States, 1948–50, by countries of destination, in gross tons

[U. S. Department of Commerce]

Destination	1948		1949		1950	
	Gross tons	Value	Gross tons	Value	Gross tons	Value
Australia			12	$3,109	7	$2,748
Canada	3,019,683	$13,192,918	[1] 2,168,763	12,312,318	2,549,678	15,729,929
Canal Zone			9	200		
French Morocco	99	4,951				
Gold Coast					1	463
Japan	60,869	546,089	251,791	2,293,560		
Netherlands	15	1,021	75	5,804		
Norway			75	788		
Philippines			[1] 4,047	36,806	7	639
United Kingdom			3	1,232	11	2,966
Total	3,080,666	13,744,979	[1] 2,424,775	14,653,817	2,549,704	15,736,745

[1] Revised figure.

BENEFICIATION

The quantity of usable iron-ore shipments subjected to some form of treatment designed to eliminate a portion of the undesirable constituents increased to 27.5 percent in 1950 compared with 24.5 percent in 1949. The trend toward more complex beneficiation of a greater proportion of the domestic output may be expected to continue as reserves of direct-shipping grades are diminished.

Taconite concentrates are expected to eventually reach a total exceeding 25 million tons annually, and plans for implementing this program are being pushed by three principal groups. The Oliver Iron Mining Co., subsidiary of United States Steel Corp., began construction of an agglomerating plant at Virginia, Minn., on April 4, 1950.[14] The plant will be a part of a $17 to $20 million program to obtain basic information before permanent processing plants are built. One of the most difficult problems encountered in the research phase was to agglomerate economically the fine iron oxide particles of the concentrate into a suitable physical structure for handling during transportation and charging into blast furnaces. The new plant will obtain data on several methods of agglomeration, already developed on a laboratory scale, to determine the most feasible one. Capacity is to be 1 million tons of product a year.[15]

Erie Mining Co., managed by Pickands, Mather & Co., has a plant in operation at Aurora, Minn., which is experimenting with taconite and other concentrates. Data obtained from this plant will supply the basis for planning permanent facilities estimated to reach an eventual capacity of 10 million tons a year.[16]

The Reserve Mining Co. owns a large quantity of magnetic taconite reserves and is formulating plans for processing facilities to be constructed in the near future.

The foregoing summary of the major developments refers to plans that will require enormous expenditures for processing plants and equipment and appreciable time before full production can be attained. A new approach to the problem that would bypass smelting in the blast furnace, and consequently the agglomeration necessary for such smelting, was presented by John J. Howard, former vice president of E. J. Lavino & Co. of Philadelphia.[17]

Other aspects of iron-ore beneficiation include heavy-medium separation, a method that is spreading rapidly owing to the very satisfactory results obtained where these plants are already in operation. The process utilizes a suspension of finely ground ferrosilicon (usually) in water, adjusted to a specific gravity between that of the iron-bearing particles and gangue particles of the feed. The growth and application of the process were described.[18]

Beneficiation of iron ore in the Birmingham district presents problems peculiar to low-grade hematite and brown ores. Since substantial reserves of these ores are available, it is evident that beneficiation research will receive increasing attention in the future. A survey of southern beneficiation was published.[19]

In general, iron-ore beneficiation is increasingly desirable for a number of reasons. The high iron content of the product affords savings in transportation, handling, and smelting. Often, concentrates may be blended with an ore, otherwise unusable, making a greatly increased tonnage available for use in blast furnaces; and, when certain treated products have been tested by charging into

[14] Engineering and Mining Journal, vol. 151, No. 5, May 1950, p. 116.
[15] Steel Magazine, vol. 126, No. 11, Mar. 13, 1950, p. 58.
[16] Engineering and Mining Journal, vol. 151, No. 5, May 1950, p. 116.
[17] Howard, John J., A New Approach to Taconite Utilization: Mining Eng., vol. 187, No. 5, May 1950, pp. 560–563.
[18] Hedges, R. W., High-Grade Iron Ore from Low-Grade Deposits: Iron Age, vol. 166. No. 5, Aug. 3, 1950, pp. 79–84.
[19] Rose, E. H., The Beneficiation of Southern Iron Ores: Min. Cong. Jour., vol. 36, No, 5, May 1950, pp. 32–35, 60.

blast furnaces without dilution, furnace-operation efficiencies have improved so that, when translated into savings, relatively high-cost products of beneficiation become economically usable.

TABLE 21.—Iron ore shipped from mines in the United States, 1925–29 (average) and 1930–50, in gross tons, and percentage of beneficiated ore compared to total shipped

[Exclusive of ore containg 5 percent or more manganese]

Year	Beneficiated	Total	Proportion of beneficiated to total (percent)	Year	Beneficiated	Total	Proportion of beneficiated to total (percent)
1925–29 (av.)	8,653,590	66,697,126	13.0	1940	12,925,741	75,198,084	17.2
1930	8,973,888	55,201,221	16.3	1941	19,376,120	93,053,994	20.8
1931	4,676,364	28,516,032	16.4	1942	23,104,945	105,313,653	21.9
1932	407,486	5,331,201	7.6	1943	20,117,685	98,817,470	20.4
1933	3,555,892	24,624,285	14.4	1944	20,303,422	94,544,635	21.5
1934	4,145,590	25,792,606	16.1	1945	19,586,782	87,580,942	22.4
1935	6,066,601	33,426,486	18.2	1946	15,588,763	69,494,052	22.4
1936	9,658,699	51,465,648	18.8	1947	21,407,760	92,670,188	23.1
1937	12,350,136	72,347,785	17.1	1948	23,629,265	100,274,965	23.6
1938	4,836,435	26,430,910	18.3	1949	20,658,232	84,174,399	24.5
1939	9,425,809	54,827,100	17.2	1950	26,717,928	97,150,704	27.5

EMPLOYMENT

Preliminary employment figures for 1950 indicate no significant change in the number of workers employed. However, the total man-hours worked increased 8 percent to 66,660,000. This total, divided into the 98,398,651 gross tons of usable iron and manganiferous ores produced, indicates an average output of 1.476 tons per man-hour, compared with 1.378 tons in 1949 and 1.462 tons in 1948. The low figure in 1949 is attributable to the generally relaxed pressure of demand and possibly in some instances to labor disturbances preceding and during the steel strike of 1949.

The above data and table 22 include, in the Lake Superior district, manganiferous ore, which is considered a special grade of iron ore by the trade.

TABLE 22.—Employment at iron-ore mines and beneficiating plants, quantity and tenor of ore produced, and average output per man in 1949, by districts and States [1]

District and State	Employment					Production									
	Average number of men employed	Time employed				Crude ore (gross tons)	Usable ore			Average per man (gross tons)					
		Average number of days	Total man-shifts	Man-hours			Gross tons	Iron contained		Crude ore		Usable ore			
				Average per shift	Total			Gross tons	Percent natural	Per shift	Per hour	Per shift	Per hour	Iron contained	
														Per shift	Per hour
Lake Superior: [1]															
Michigan	8, 036	240	1, 929, 225	7. 99	15, 423, 850	12, 632, 581	12, 632, 581	6, 697, 248	53. 02	6. 548	0. 819	6. 548	0. 819	3. 471	0. 434
Wisconsin															
Minnesota	12, 449	249	3, 102, 850	8. 00	24, 818, 998	67, 535, 829	56, 723, 903	28, 476, 810	50. 20	21. 766	2. 721	18. 281	2. 286	9. 178	1. 147
Total	20, 485	246	5, 032, 075	8. 00	40, 242, 848	80, 168, 410	69, 356, 484	35, 174, 058	50. 71	15. 931	1. 992	13. 783	1. 723	6. 990	. 874
Southeastern States: [2]															
Alabama	5, 757	242	1, 393, 742	8. 06	11, 239, 248	10, 336, 830	7, 368, 784	2, 687, 360	36. 47	7. 417	. 920	5. 287	. 656	1. 928	. 239
Georgia	103	246	25, 345	10. 00	253, 425	1, 143, 500	228, 689	96, 288	42. 10	45. 117	4. 512	9. 023	. 902	3. 799	. 380
Total	5, 860	242	1, 419, 087	8. 10	11, 492, 673	11, 480, 330	7, 597, 473	2, 783, 648	36. 64	8. 090	. 999	5. 354	. 661	1. 962	. 242
Northeastern States:															
New Jersey	816	241	196, 991	8. 41	1, 656, 815	921, 422	448, 811	282, 792	63. 01	4. 677	. 556	2. 278	. 271	1. 436	. 171
New York	3, 037	252	763, 953	8. 05	6, 152, 295	7, 483, 353	3, 415, 022	2, 091, 388	62. 59	9. 796	1. 216	4. 470	. 555	2. 738	. 340
Pennsylvania									57. 73						
Total	3, 853	240	960, 944	8. 13	7, 809, 110	8, 404, 775	3, 863, 833	2, 374, 180	61. 45	8. 746	1. 076	4. 021	. 495	2. 471	. 304
Western States:															
California	183	261	47, 755	8. 06	385, 056	539, 619	539, 619	300, 202	55. 63	11. 300	1. 401	11. 300	1. 401	6. 286	. 780
Nevada															
Missouri	766	198	151, 697	8. 06	1, 222, 022	2, 403, 353	1, 189, 662	565, 238	47. 51	15. 843	1. 967	7. 842	. 974	3. 726	. 463
Texas															
Wyoming	346	259	89, 611	8. 00	716, 869	2, 712, 390	2, 712, 390	1, 455, 403	53. 66	30. 268	3. 784	30. 268	3. 784	16. 241	2. 030
Utah															
Total	1, 295	223	289, 063	8. 04	2, 323, 947	5, 655, 362	4, 441, 671	2, 320, 843	52. 25	19. 564	2. 434	15. 366	1. 911	8. 029	. 999
Total 1949 [2]	31, 493	245	7, 701, 169	8. 03	61, 868, 578	105, 713, 097	85, 263, 810	42, 652, 729	50. 02	13. 727	1. 709	11. 072	1. 378	5. 538	. 689

1 Includes manganese-bearing ore from the Lake Superior district.
2 Man-hour data for Virginia are not available and are therefore excluded from all totals; however, production data for Virginia (4,349 tons of usable ore) are included with total production.

WORLD REVIEW

Table 24 shows world production of iron ore, by countries, in recent years.

The iron-ore resources of the world were reviewed by Einecke.[20] The work is in two volumes, one of text and tables, the other of maps showing iron, manganese, and coal deposits.

CANADA[21]

The time is approaching when Canada will take its place among the world's leading producers of iron ore. The vast reserves of ore in Quebec and Labrador are being developed rapidly; the Steep Rock mines in northwestern Ontario are being expanded in the face of difficult obstacles; production of siderite sinter has been expanded in the Michipicoten district; the Wabana deposits worked from Bell Island, Newfoundland, have prospects of a larger foreign market; and explorations are being made on Adirondack-type magnetite deposits in the Grenville area of Ontario and Quebec.

Canadian shipments in 1950 were 3,271,000 metric tons as compared with 3,334,000 tons in 1949, a decrease of 2 percent.

Labrador-Quebec.—A list of members of the board of directors, Iron Ore Co. of Canada, Ltd., was published, and all of the American firms participating in development of the Labrador-Quebec deposits were represented. The list includes George M. Humphrey, president, M. A. Hanna Co.; Jules R. Timmins, president, Hollinger Consolidated Gold Mines, Ltd.; C. M. White, president, and W. W. Hancock, secretary, Republic Steel Corp.; W. W. Holloway, chairman, and A. S. McFarland, president, Wheeling Steel Corp.; Frank Purnell, chairman, and J. L. Manthe, president, Youngstown Sheet & Tube Co.; J. Y. Murdock, president, Noranda Mines, Ltd.; Charles R. Hook, chairman, and W. W. Sebald, president, Armco Steel Corp.; John I. Rankin and Leo H. Timmins, N. A. Timmins Corp.; E. T. Weir, chairman, National Steel Corp.; and Joseph H. Thompson, president, Hanna Coal & Ore Corp.[22]

Development work and exploration on the deposits continued in 1950, and the last reserve figure published was 400 million tons of proved ore.[23] Emphasis was removed from exploration at the end of the summer, and efforts were concentrated on construction of the railroad to Seven Islands on the St. Lawrence River.[24] The construction contract has been let, and supplies have been distributed along the first 100 miles of right of way above Seven Islands. A winter road serves the construction points, and two airstrips were being built along the right of way. Temporary docks at Seven Islands for unloading supplies have been built, and permanent docks were scheduled for construction in 1951. Plans call for ore shipments to begin in 1955 and for the initial objective of 10 million tons a year to be reached shortly thereafter.

The need of the United States steel industry for this ore was a prime subject of discussion in Congressional hearings on the St. Lawrence Seaway during the spring of 1950, and it is anticipated

[20] Einecke, Gustav, Die Eisenerzvorrätte der Welt: Verlag Stahleisen M. B. H., Dusseldorf, 1950.
[21] Much of the information in this section is from Goodwin, W. M., Iron Ore in 1950 (preliminary): Canadian Bureau of Mines, Ottawa (amended to Sept. 4, 1951), 9 pp.
[22] Skillings' Mining Review, vol. 38, No. 33, Nov. 25, 1950.
[23] Iron Age, vol. 166, No. 9, Aug. 31, 1950, p. 71.
[24] Skillings' Mining Review, vol. 38, No. 36, Dec. 16, 1950.

that transportation of Labrador ore may be instrumental in the final approval of this much needed facility. Aspects of this problem were presented.[25]

Newfoundland.—Output of iron ore from the Wabana hematite mines of Dominion Steel & Coal Corp., Ltd., decreased 29 percent below 1949 owing to lack of overseas markets. Shipments to the company furnaces at Sydney, Nova Scotia, increased 12 percent, and small shipments were made to Germany and the United States. However, shipments to the United Kingdom, normally a major purchaser, dropped from 720,000 long tons in 1949 to 127,000 tons in 1950. This drastic reduction in exports caused a drop in employment of 2,000 miners.[26] Prospects for 1951 were brighter owing to new purchase contracts with the United Kingdom made late in 1950.

The tramway, formerly used to transport ore 2 miles across the island to loading docks, has been replaced with 20-ton trucks, and underground mechanization continued. Wabana ore, though situated for cheap ocean transport, suffers from its high phosphorus and silica content, which prevents its wide use in United States furnaces.

Ontario.—Output of Steep Rock Iron Mines, Ltd., in 1950 was 1,217,000 tons compared with 1,134,000 in 1949. Production was from the Errington open pit, which was stripped for production during the winter of 1949–50. The northern part of the Errington pit was being stripped for production in 1951, and the Hogarth mine was being drained preparatory to removing 40 million cubic yards of gravel and silt. The expected output of the Hogarth mine will bring total production of the Steep Rock district to over 3 million tons per year. Underground development in the Errington mine continues, with sublevels planned for draining the working level. Extensive drilling on the "C" deposit at Falls Bay produced favorable results not yet released in detail.

Algoma Ore Properties, Ltd., produced and sintered siderite from its underground Helen mine in the Michipicoten district. The total of 958,000 tons of sinter was 45 percent higher than the 662,000 tons produced in 1949. After sintering, one-third of this ore is consumed by Algoma Steel Corp. at Sault Sainte Marie and two-thirds by United States furnaces. It is particularly desirable because of its high iron and 3-percent-manganese content.

Although the Helen mine was the only producer in this district during 1950, other ore bodies were being explored for possible exploitation. Near the Helen mine, the Ruth and Lucy deposits have an indicated 40 million tons of ore that may be developed by the Jalore Mining Co., Ltd., a subsidiary of the Jones & Laughlin Steel Corp.; Siderite Hill, also near the Helen mine, has a proved 100 million tons of ore grading slightly higher than Helen ore. It is estimated that 10 million tons could be mined from an open pit. The Britannia (formerly Bartlett) deposit, owned by Algoma Ore Properties, lies 10 miles northeast of the Helen mine and though not suitable for open-pit mining contains a high-grade ore. In general, expansion in this district is conditioned by sintering capacity, since transportation costs for carbonate ore are such as to necessitate calcination and sintering.

---

[25] Durrell, W. H., Labrador Iron Ore and the St. Lawrence Seaway: Eng. and Min. Jour., vol. 151, No. 5, May 1950, pp. 92–93.

[26] Metal Bulletin (London), No. 3459, Jan. 17, 1950, p. 15.

In the Greenville area of Ontario and Quebec, large deposits of magnetite were discovered when anomalies were indicated by air-borne magnetometric surveys in 1949. Diamond drilling by Bethlehem Steel Corp. has proved tonnage running to millions in a deposit at Marmora. These deposits are similar to those in the Adirondack region of New York, and presumably the ore would require crushing and magnetic concentration.

The Quebec Iron & Titanium Corp. is processing titaniferous iron ore, smelting 300 tons daily to produce 100 tons of pig and 130 tons of titania slag.[27]

OTHER COUNTRIES

Brazil.—The vast iron-ore resources of Brazil have been the subject of extensive investigation and study by John Van N. Dorr II, geologist, United States Geological Survey. The study, a joint project of the Survey and the Brazilian Departmento Nacional da Producão Mineral, undertook to appraise the quantity, quality, and types of iron ore in an area comprising approximately 4,000 square miles in the State of Minas Gerais. A preliminary discussion was published.[28]

Exploitation of Brazil's iron ore deposits is hampered by high costs, particularly with respect to transportation. A hard, dense, lump hematite is now being exported for use in open-hearth furnaces.

Chile.—El Tofo mine of Bethlehem Chile Iron Mines Co. increased output 15 percent over 1949 to 2,940,618 gross tons. Bethlehem's ocean transport facilities were described.[29]

Cuba.—The Mayari deposit produced a small quantity of brown ore during 1950. Table 23 gives historical data for Cuban iron-ore mines.

TABLE 23.—Iron ore shipped from mines in the Province of Oriente, Cuba, 1884–1950, in gross tons

Year	Juragua, Daiquiri and Estancia (hematite and magnetite)	Sigua (hematite)	Mayari (brown ore)	Guama (hematite)	El Cuero (hematite)	Total
1884–1948	22,740,281	20,438	4,079,158	41,241	903,103	27,784,221
1949			11,446			11,446
1950			30,215			30,215
Total	22,740,281	20,438	4,120,819	41,241	903,103	27,825,882

Egypt.—Iron deposits at Aswan on the upper Nile River are estimated to contain 13.5 million tons of ore minable by surface methods.[30] On the basis of this deposit, proposals to establish a domestic iron and steel industry capable of producing 300,000 tons of steel annually have been activated to the extent of having a survey of the possibilities made by European and American experts. This survey was reported to favor implementation of the proposed industry.

Finland.—The Diet granted an appropriation in the 1950 budget for establishing a joint stock company to exploit the Otänmaki iron

[27] Engineering and Mining Journal, vol. 151, No. 11. November 1950, p. 144.
[28] Dorr, John Van N., II. How Much Iron Ore in Brazil? Part I: Iron Age, vol. 166, No. 7, Aug. 17, 1950, pp. 81–84. Part II, Iron Age, vol. 166, No. 8, Aug. 24, 1950, pp. 79–82.
[29] Skillings' Mining Review, vol. 38, No. 39, Jan. 7, 1950.
[30] Foreign Commerce Weekly, vol. 38, No. 5, Jan. 30, 1950, p. 30.

deposit. On March 10, 1950, the initial meeting was held, and a joint stock company, Otänmaki, Oy., was formed. The capital stock of the company is controlled by the Finnish Government, Bank of Finland, and Imatran Voima Oy, the leading Finnish electric power company.[31]

Finnish requirements for iron ore are made more urgent by efforts to pay war indemnities to Russia in terms of iron and steel products.

France.—It was reported in December 1949 that a rich vein of iron ore had been discovered in the region of Salzerais, Meurthe et Moselle. A concession has been applied for by the general director of the Société des Fonderies de Pont-à-Mousson.[32]

The deposits, near Caen, Normandy, which are principally carbonate ores, altered near the surface to hematite and magnetite, are being considered for reactivation. Reserves are quite large. Tonnage estimates vary according to the depth to which mining is judged practicable.[33]

French West Africa.—In addition to the Norman iron ore deposits, the French iron and steel industry has a deposit containing an estimated 165 million tons at Conakry, French West Africa. ECA funds amounting to $1,975,650 have been made available on a matching basis for development.[34] Development is under way, and the French-controlled Conakry Mining Co. hopes to begin ore shipments before the end of 1952.

India.—Although India has vast deposits of iron ore that might be worked for export trade as well as for the domestic iron and steel industry, internal transportation difficulties have caused the Ministry of Commerce to place iron ore under export control.[35]

A limited quantity was approved for export to Japan.

Japan.—Iron ore for Japanese furnaces for many years came from deposits under its control in North China and Manchuria. However, with revival of the iron and steel industry following World War II, this ore was unavailable, and it became necessary to look elsewhere. Some ore was obtained from the Philippines, Malaya, and India; but, due to various reasons, the supply from these sources could not keep pace with demand, and the industry turned to western North America for additional tonnages. During the latter part of 1950, miners and export firms on the Pacific coast were actively searching for substantial deposits of iron ore upon which to build an export trade to Japan.

Liberia.—The Bomi Hills deposit of open-hearth lump iron ore was in process of development during 1950. Since mining is to be a surface operation and will require little in the way of stationary equipment, principal efforts were in the construction of rail facilities from the deposit 45 miles to Monrovia.[36] This important new source of iron ore for United States consumption will begin shipments in 1951. A review of the history of this project explains the part played by the Liberia Mining Co., the Liberia Co., the Republic Steel Corp., and the Export-Import Bank.[37]

---

[31] Bureau of Mines, Mineral Trade Notes, vol. 31, No. 2, August 1950, p. 16.
[32] Bureau of Mines, Mineral Trade Notes, vol. 30, No. 4, p. 10.
[33] Steel Magazine, vol. 126, No. 25, June 19, 1950, p. 61.
[34] Canadian Mining Journal, vol. 71, No. 9, September 1950, p. 95.
[35] Mining World, vol. 12, No. 2, February 1950, p. 43.
[36] Mining World, vol. 12, No. 4, April 1950, p. 40.
[37] Engineering and Mining Journal, vol. 151, No. 1, January 1950, p. 85.

Malaya.—The Bukit Besi mine at Kuala Dungan in the Trengganu State has installed modern mining equipment from the United States, and plans call for greatly expanded production which will go to Japan, and possibly to Britain.[38]

Republic of the Philippines.—Iron mining is undergoing an encouraging revival in the Philippines, supported by its principal customer, Japan. However, some uneasiness was expressed over currency exchange difficulties.[39] Prewar exports to Japan were of the order of 1,300,000 tons annually.

Sweden.—European and American demand for Swedish iron ore gained considerable weight in late 1950 owing to expanded steel production in support of rearmament plans for members of the North Atlantic Pact. Output has approximately doubled since 1946, roughly paralleling the rehabilitation of the European iron and steel industry. The Grangeburg iron mines were described.[40]

United Kingdom.—The lowest grade of iron ore in commercial use for the manufacture of iron and steel is produced from the "ironstone" mines, Lincolnshire, England. A description of these operations includes the following typical analysis: Iron, 22.80 percent; managenese, 0.69 percent; silica, 8.07 percent; alumina, 4.53 percent; lime, 18.30 percent; magnesia, 1.96 percent; phosphorus, 0.34 percent; sulfur, 0.32 percent; loss on ignition, 24.37 percent; moisture, 9.80 percent.[41]

It may be seen that use of this ore is possible because of the presence of over 20 percent of lime and magnesia, which more than fluxes the silica and alumina.

Venezuela.—Wide interest was evinced throughout the Western Hemisphere early in 1950 when the United States Steel Corp. released for publication the story of its iron-ore explorations and discoveries in Venezuela. The news of this important development is now general knowledge to the reading public, some reference to the discoveries having been made by most news publications. One of the most comprehensive descriptions is identified by the footnote below.[42] The Pao deposit, nearer to the mouth of the Orinoco River than Cerro Bolivar, has been under development for several years by Bethlehem Steel Co.; and, though no shipments were made during 1950, mining was begun and a stockpile was ready for shipment early in 1951.

Other iron deposits in the Orinoco River area of Venezuela have been discovered, and in the San Isidro area the Government of Venezuela is surveying the possibilities.[43]

---

[38] Bureau of Mines, Mineral Trade Notes, vol. 30, No. 3, March 1950, p. 13.
[39] Engineering and Mining Journal, vol. 151, No. 1, January 1950, p. 132.
[40] Ross, H. U., The Grangeburg Iron Ore Mines, Sweden: Skillings' Mining Review, vol. 38, No. 47, Mar. 4, 1950.
[41] Ross, H. U., Ironstone Mining in Lincolnshire, England: Skillings' Mining Review, vol. 38, No. 51, Apr. 1, 1950.
[42] Lippert, T. W., Cerro Bolivar, Saga of an Iron-Ore Crisis Averted: Min. Engineering, vol. 187, No. 2, Feb. 1950, pp. 178–192.
[43] Iron Age, vol. 165, No. 16, Apr. 20, 1950, p. 107.

TABLE 24.—World production of iron ore, by countries, 1944–50, in thousands of metric tons [1]

[Compiled by Pauline Roberts]

Country [1]	1945	1946	1947	1948	1949	1950
North America:						
Canada	1,030	1,406	1,741	1,213	3,334	3,271
Newfoundland	1,000	1,264	1,467	1,492		
Cuba	------------	------------	63	37	12	12
Mexico	283	275	332	333	363	420
United States	89,795	71,980	94,586	102,625	86,301	99,619
South America:						
Argentina	43	55	61	(2)	(2)	(2)
Brazil	716	518	927	1,441	1,489	1,900
Chile [3]	945	1,353	1,608	2,545	2,597	2,976
Venezuela	------------	------------	------------	------------	------------	190
Europe:						
Austria	323	462	885	1,269	1,488	1,859
Belgium	30	40	58	97	42	46
Czechoslovakia	276	1,116	1,363	1,428	[4] 1,400	[4] 1,600
France [5]	7,713	16,232	18,719	23,061	31,424	30,203
Germany:						
Federal Republic [6]	[4] 6,000	3,904	4,463	7,276	9,112	10,882
Soviet zone [6]		236	283	[4] 250	[4] 250	[4] 328
Greece (exports)	------------	13	41	47	22	41
Hungary	[7] 48	133	244	318	339	368
Italy	134	132	226	543	521	442
Luxembourg	1,406	2,247	1,992	3,399	4,137	3,845
Norway	79	60	128	199	267	[8] 430
Poland	106	395	504	659	699	790
Rumania	141	112	121	[4] 209	[4] 324	[4] 395
Spain	1,171	1,596	1,514	1,631	1,876	2,079
Sweden	3,930	6,867	8,895	13,287	13,748	13,927
Switzerland	17	18	45	75	70	55
U. S. S. R. [9]	[4] 18,000	[4] 21,000	[4] 24,000	(2)	(2)	(2)
United Kingdom:						
Great Britain [10]	14,426	12,368	11,269	13,299	13,612	13,145
Northern Ireland	(2)	------------	------------	------------	------------	(2)
Yugoslavia	[4] 34	399	739	879	835	[4] 800
Asia:						
China	4,178	[11] 15	[11] 19	[4] [11] 247	(2)	(2)
Hong Kong	------------	------------	------------	1	59	169
India	2,301	2,446	2,539	2,321	2,854	[4] 3,000
Indochina	8	------------	------------	------------	------------	------------
Japan [12]	[13] 1,356	566	500	561	780	910
Korea:						
North	833	[4] 75	[4] 93	(2)	(2)	(2)
South			------------	------------	------------	------------
Malaya	14	(14)	1	1	9	507
Philippines	(2)	------------	------------	18	370	599
Portuguese India	------------	------------	------------	8	151	131
Turkey	126	112	149	192	211	234
U. S. S. R.	(9)	(9)	(2)	(2)	(2)	(2)
Africa:						
Algeria	1,202	1,671	1,558	1,872	2,538	2,573
French Morocco	(14)	125	156	304	357	319
Northern Rhodesia	(14)	(14)	2	(14)	2	(2)
Sierra Leone	841	741	854	968	975	1,185
Southern Rhodesia	------------	------------	(14)	30	51	57
Spanish Morocco	765	787	869	904	944	860
Tunisia	132	184	404	690	712	758
Union of South Africa	775	947	1,162	1,164	1,242	1,189
Oceania:						
Australia	1,589	1,849	2,181	2,077	1,484	2,403
New Caledonia	------------	------------	(2)	(2)	------------	15
New Zealand	6	8	6	5	4	------------
Total (estimate)	162,000	154,000	187,000	217,000	220,000	245,000

1 In addition to countries listed, Belgian Congo, Bulgaria, Burma, Egypt, Eritrea, French West Africa, Madagascar, Portugal, and South-West Africa report production of iron ore in past years, but quantity produced is believed insufficient to affect estimate of world total.
2 Data not available; estimate by author of chapter included in total.
3 Production of Tofo mines.
4 Estimate.
5 Including Moselle (Lorraine).
6 Exclusive of manganiferous iron ore carrying 12 to 30 percent manganese.
7 Data represent Trianon Hungary after October 1944.
8 Including titaniferous iron ore.
9 U. S. S. R. in Asia included with U. S. S. R. in Europe.
10 Exclusive of bog ore, which is used mainly for purification of gas.
11 Production of National Resources Commission only.
12 Includes iron-sand production as follows: 1945–46, 235,094 tons; 1946, 10,472 tons; 1947, 3,772 tons; 1948, 2,588 tons; 1949, 23,724 tons; 1950, 87,504 tons.
13 Fiscal year ended March 31 of year following that stated.
14 Less than 500 tons.

Iron and Steel

by Robert H. Ridgway and Norwood B. Melcher

GENERAL SUMMARY

STEEL production in the United States in 1950 reached an all-time high of 96,836,075 net (short) tons as compared with the previous maximum of 88,640,470 net tons in 1948. World production of steel ingots and castings in 1950 was estimated to be 186,000,000 metric tons (205,027,800 net tons). This figure does not include production of castings by companies that do not produce steel ingots in the United States. Beginning at a high level, production increased generally throughout the year. In April and October production exceeded 100 percent of capacity. In June, because of the outbreak of the Korean War, metal prices began to spiral. By September formula prices had been set on steel-making scrap. A steel gray market had developed, and cold-rolled steel brought up to $360 per ton. By December steel prices had advanced; the Iron Age base composite rose $5.88 per ton, and tool-steel prices advanced 10 percent. Scrap buying prices were raised by mills, sending the Iron Age scrap composite to $45.13. Steel gray-market prices were reported at approximately $400 a ton.[1]

Steel production advanced in spite of the coal strike in February. In September the pattern for the "fifth round" of wage increases was established, with an increase of 5 and 10 cents an hour plus cost-of-living adjustments and a $125 pension. In December steel wages were raised an average of 16 cents per hour.

The 5-year write-off of taxes on defense plants stimulated plans for expansion. The steel industry planned to expand capacity to 109,963,000 net tons by the end of 1952—9.4 million net tons over July 1, 1950, capacity. The United States Steel Corp. announced detailed plans for construction of the Fairless Works near Trenton, N. J. An integrated steel corporation for New England was planned, and a formal application for 5-year amortization of facilities was made. Western steel production followed the national pattern, with operations running 90 to 95 percent of capacity until the Korean War, when production reached 100 to 106 percent. Plant expansion and modernization of furnaces contributed to production capacity in the West as elsewhere throughout the country.

In spite of the Chrysler 100-day strike, virtually all of the automotive industry's production, sales, and profit records were shattered in 1950. The automotive industry received 14,496,230 net tons, or 20.3 percent of the finished steel produced, according to Steel Mag-

[1] Iron Age, vol. 167, No. 1, Jan. 4, 1951, p. 284.

azine.[2] An estimated 8,295,000 units (passenger cars and trucks) were produced.

The construction industry received 11.9 percent of steel shipments in 1950. Construction of new houses (permanent, nonfarm dwellings) was high in 1950, with an estimated 1,379,000 units started during the year as compared with 1,025,100 in 1949. Total new construction during the year was valued at $27.7 billion, compared with $19.3 billion in 1949, and absorbed 8.6 million tons of steel products.

TABLE 1.—Salient statistics of iron and steel in the United States, 1946–50, in net (short) tons

	1946	1947	1948	1949	1950
Pig iron:					
Production	44,842,025	58,327,231	60,073,140	53,323,142	64,499,983
Shipments	45,075,890	58,367,510	60,051,350	52,919,019	64,626,146
Imports	14,091	32,624	[1] 219,252	99,804	795,965
Exports	95,698	40,202	7,032	81,309	6,813
Steel: [1]					
Production of ingots and castings:					
Open-hearth:					
Basic	60,112,300	76,209,268	78,714,852	69,742,110	85,661,651
Acid	599,663	664,525	625,305	506,693	600,858
Bessemer	3,327,737	4,232,543	4,243,172	3,946,656	4,534,558
Crucible	} 2,563,024	18	} 5,057,141	3,782,717	6,039,008
Electric		3,787,717			
Total	66,602,724	84,894,071	88,640,470	77,978,176	96,836,075
Capacity, annual, as of Jan. 1	91,890,560	91,241,250	94,233,460	96,120,930	99,382,800
Percent of capacity	72.5	93.0	94.1	81.1	96.9
Production of alloy steel:					
Stainless	550,097	519,933	617,378	[2] 455,093	832,309
Other than stainless	5,527,098	6,908,298	7,863,736	[2] 5,442,476	7,737,796
Total	6,077,195	7,428,231	8,481,114	5,897,569	8,570,105
Shipments of steel products:					
For domestic consumption	45,763,761	58,850,458	62,728,250	54,586,039	69,665,819
For export	3,011,771	4,206,692	3,244,888	3,517,971	2,566,473
Total	48,775,532	63,057,150	65,973,138	58,104,010	72,232,292

[1] American Iron and Steel Institute.
[2] Revised figure.

The container industry used more steel in 1950 than in 1949, when consumption dropped below the 1948 figure. The figure for 1950 was 5.9 million net tons and the 1948 figure, 5.3 million tons. Railroads received 6 percent of the steel products in 1950, as in 1949, and 8 percent in 1948. Freight-car loadings in 1950 increased substantially over 1949. Shipbuilding requirements were at the lowest point since 1946, and exports were at the lowest rate in more than a decade.

Steel products for export decreased markedly from 1949, according to the U. S. Department of Commerce. However, exports of galvanized iron and steel sheets increased from 85,594 net tons to 100,361 net tons; rail joints, splice bars, fishplates, and tieplates increased slightly; and railroad spikes more than doubled.

Average weekly hours per worker in the steel industry were 39.9 hours as compared with 37.9 hours in 1949 and 39.1 hours in 1948. Average hourly earnings were $1.689 as compared with $1.703 in 1949. Total employment was higher in 1950 than in 1949, increasing from

[2] Steel, vol. 128, No. 1, Jan. 1, 1951, pp. 123–136.

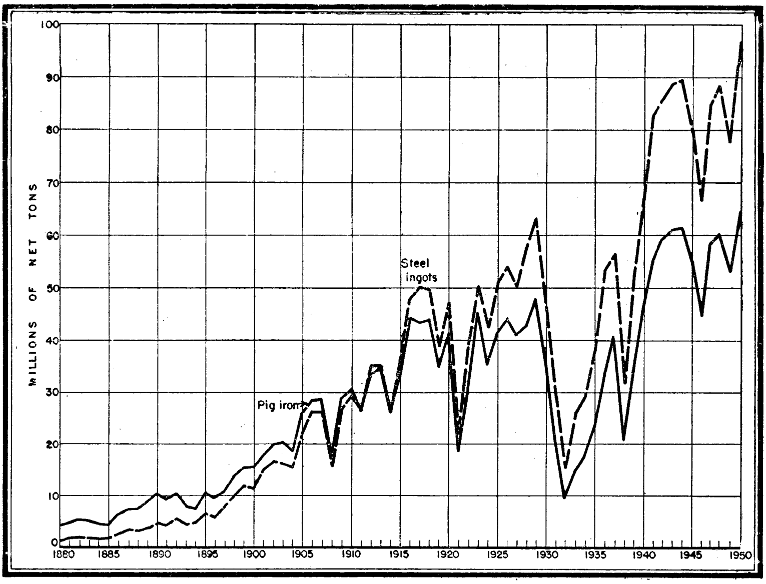

FIGURE 1.—Trends in production of pig iron and steel ingots in the United States, 1880–1950.

511,000 in January to 556,000 in December 1950. The composite price of finished steel as published in Iron Age was 3.837 cents per pound throughout the year until December, when the price was increased to 4.131 cents per pound.

PRODUCTION AND SHIPMENTS OF PIG IRON

Domestic production of pig iron, exclusive of ferro-alloys, increased 21 percent over 1949 and 7 percent over 1948 to 64,499,983 net tons in 1950. Pig iron production in 1950 consumed 91,600,306 net tons of domestic iron and manganiferous ores, and 6,635,420 tons of foreign ores (mainly from Africa, Canada, Chile, México, and Sweden), 18,766,333 tons of sinter, and 9,538,226 tons of miscellaneous iron-bearing materials. In addition to these raw materials, 2,020,407 tons of home scrap and 130,599 tons of flue dust were consumed in making pig iron in 1950.

Shipments of pig iron increased 22 percent in quantity and 24 percent in value from 1949. The figures in table 4 cover total "shipments," which consist predominantly of molten pig iron transferred to steel furnaces on the site. Values for merchant pig iron are included. However, the average value per ton of pig iron is lower than market prices published in trade journals because handling charges, selling commissions, freight costs, and other related items are not considered. The term "shipped," as distinguished from "production," refers in the case of onsite transfers to departmental transfers, upon which value is placed for bookkeeping purposes rather than to actual sales as in the case of merchant pig iron.

TABLE 2.—Pig iron produced and shipped in the United States, 1949–50, by States

State	Produced: 1949 (net tons)	Produced: 1950 (net tons)	Shipped from furnaces: 1949 Net tons	Shipped from furnaces: 1949 Value	Shipped from furnaces: 1950 Net tons	Shipped from furnaces: 1950 Value
Alabama	3,662,801	4,347,331	3,664,801	$131,162,133	4,307,035	$167,984,326
California	504,581	660,463	494,300		667,145	
Colorado						
Texas	2,068,917	2,572,895	2,003,329	103,312,763	2,577,127	139,453,422
Utah						
Illinois	4,912,810	6,035,333	4,904,281	204,467,609	6,038,572	258,242,109
Indiana	6,014,258	7,018,237	6,028,173	248,700,000	7,012,970	297,568,747
Kentucky	627,435	753,855	627,435	(1)	753,855	(1)
Maryland	2,929,142	3,525,694	2,931,596	(1)	3,525,475	(1)
Massachusetts	168,061	147,511	125,422	(1)	181,998	(1)
Michigan	1,534,756	2,189,696	1,542,206	(1)	2,157,298	(1)
Minnesota	467,230	639,774	455,378	(1)	652,267	(1)
New York	3,373,409	4,154,039	3,243,800	142,107,633	4,221,534	180,158,268
Ohio	10,567,321	12,510,703	10,524,132	430,627,906	12,521,354	530,707,544
Pennsylvania	15,007,287	18,239,608	14,893,515	641,033,455	18,300,347	788,496,589
Tennessee						
West Virginia	1,485,134	1,704,844	1,480,651	(1)	1,709,169	(1)
Virginia	------------	------------				
Undistributed [1]	------------	------------	------------	323,882,858	------------	406,790,469
Total	53,323,142	64,499,983	52,919,019	2,225,294,357	64,626,146	2,769,401,474

[1] Data that may not be shown separately because they would reveal individual company operations are combined as "Undistributed."

TABLE 3.—Foreign iron ore and manganiferous iron ore consumed in the manufacture of pig iron in the United States, 1949–50, by sources of ore, in net tons

Source	1949	1950	Source	1949	1950
Africa	344,685	1,033,852	India	1,638	------------
Brazil	6,910	86,967	Mexico	168,190	246,976
Canada	496,395	998,220	Sweden	449,730	1,006,029
Newfoundland	9,566	27,498	Unclassified	32,513	28,163
Chile	2,936,509	3,207,715			
Cuba	1,186	------------	Total	4,447,322	6,635,420

TABLE 4.—Pig iron shipped from blast furnaces in the United States, 1949–50, by grades [1]

Grade	1949 Net tons	1949 Value: Total	1949 Value: Average	1950 Net tons	1950 Value: Total	1950 Value: Average
Foundry	2,329,408	$91,817,177	$39.42	3,221,744	$134,068,514	$41.61
Basic	41,434,250	1,739,650,516	41.99	50,546,029	2,162,481,670	42.78
Bessemer	6,459,006	280,109,520	43.37	7,385,236	320,747,035	43.43
Low-phosphorus	221,847	10,190,651	45.94	304,259	14,655,875	48.17
Malleable	2,332,940	97,392,445	41.75	2,995,210	129,650,167	43.29
All other (not ferro-alloys)	141,568	6,134,048	43.33	173,668	7,798,213	44.90
Total	52,919,019	2,225,294,357	42.05	64,626,146	2,769,401,474	42.85

[1] Includes pig iron transferred directly to steel furnaces at same site.

Metalliferous Materials Used.—The production of pig iron in 1950 required 117,002,059 net tons of iron ore, sinter, and manganiferous iron ore, 3,533,600 net tons of mill cinder and roll scale, 3,600,267 net tons of open-hearth and Bessemer slags, 2,357,037 tons of purchased scrap, and 47,322 tons of other materials—an average of 1.962 tons of metalliferous materials (exclusive of home scrap and flue dust) per ton of pig iron made.

Alabama furnaces used red hematite from the Birmingham district and brown ores from Alabama and Georgia, as well as hematite from Missouri and the Lake Superior region. Pyrites cinder was shipped from Virginia and sintered with Alabama red ores, and cinder and byproduct ore were obtained from Tennessee. Foreign iron ore from Africa, Brazil, and Sweden and foreign manganese-bearing ores from Africa were also used.

Blast furnaces at Fontana, Calif., used iron ore from the Eagle Mountain and Vulcan mines in California and from the Excelsior mine in Utah. The small quantity of manganiferous ore used originated in Mexico.

TABLE 5.—Number of blast furnaces (including ferro-alloy blast furnaces) in the United States, 1949–50

[American Iron and Steel Institute]

State	Dec. 31, 1949			Dec. 31, 1950		
	In blast	Out of blast	Total	In blast	Out of blast	Total
Alabama	19	1	20	18	2	20
California	2	----------	2	2	----------	2
Colorado	3	1	4	4	----------	4
Illinois	19	3	22	20	2	22
Indiana	19	3	22	20	2	22
Kentucky	3	----------	3	3	----------	3
Maryland	8	----------	8	8	----------	8
Massachusetts	1	----------	1	1	----------	1
Michigan	6	----------	6	6	----------	6
Minnesota	3	----------	3	3	----------	3
New York	15	1	16	16	----------	16
Ohio	45	5	50	48	2	50
Pennsylvania	63	12	75	72	5	77
Tennessee	2	1	3	2	1	3
Texas	2	----------	2	2	1	3
Utah	3	2	5	4	1	5
Virginia	1	----------	1	1	----------	1
West Virginia	4	----------	4	4	----------	4
Total	218	29	247	234	16	250

The iron ore consumed in furnaces at Pueblo, Colo., originated from the Duncan and Blowout mines, Iron County, Utah, and the Sunrise mine, Platte County, Wyo. Manganiferous iron ore from the Boston Hill mine, Grant County, N. Mex., was also used.

Blast furnaces at Sparrows Point, Md., used various domestic iron ores, including manganiferous materials mined on the Cuyuna range in Minnesota, and foreign iron ore from Africa, Chile, and Sweden.

232294—53——42

TABLE 6.—Iron ore and other metallic materials consumed and pig iron produced, 1949–50, by States, in net tons

State	Metalliferous materials consumed: Iron and manganiferous iron ores: Domestic	Metalliferous materials consumed: Iron and manganiferous iron ores: Foreign	Metalliferous materials consumed: Sinter	Metalliferous materials consumed: Miscellaneous [1]	Metalliferous materials consumed: Total	Pig iron produced	Materials consumed per ton of pig iron made: Ores	Materials consumed per ton of pig iron made: Sinter	Materials consumed per ton of pig iron made: Miscellaneous	Materials consumed per ton of pig iron made: Total
1949										
Alabama	7,026,325	10,725	1,660,100	160,890	8,858,040	3,662,801	1.921	0.453	0.044	2.418
California	447,021	756	346,488	95,635	889,900	504,581	.887	.687	.190	1.764
Colorado, Texas, Utah	2,766,796	167,428	833,853	104,198	3,872,275	2,068,917	1.418	.403	.050	1.871
Illinois	8,443,492		749,537	694,010	9,887,039	4,912,810	1.719	.153	.141	2.013
Indiana	10,671,520	206	764,742	678,980	12,115,448	6,014,258	1.774	.127	.113	2.014
Kentucky	985,590		67,614	155,855	1,209,059	627,435	1.571	.108	.248	1.927
Maryland	1,119,797	3,422,524	351,050	529,708	5,423,079	2,929,142	1.550	.120	.181	1.851
Massachusetts	227,053	65,390		12,893	305,336	168,061	1.740		.077	1.817
Michigan	2,377,331		366,507	114,492	2,858,330	1,534,756	1.549	.239	.074	1.862
Minnesota	923,337			62,193	985,530	467,230	1.976		.133	2.109
New York	4,941,348	24,988	1,099,997	533,817	6,600,150	3,373,409	1.472	.326	.158	1.956
Ohio	14,757,305	318,470	3,469,944	1,698,851	20,244,570	10,567,321	1.427	.328	.161	1.916
Pennsylvania	21,422,585	283,889	4,438,456	2,880,487	29,025,417	15,007,287	1.446	.296	.192	1.934
Tennessee, West Virginia	2,224,630	152,946	118,785	143,216	2,639,577	1,485,134	1.601	.080	.096	1.777
Total	78,334,130	4,447,322	14,267,073	7,865,225	104,913,750	53,323,142	1.552	.268	.148	1.968
1950										
Alabama	7,651,627	182,123	2,026,465	260,744	10,120,959	4,347,331	1.802	.466	.060	2.328
California	585,085	67	430,825	116,308	1,132,285	660,463	.886	.652	.176	1.714
Colorado, Texas, Utah	3,533,890	246,909	1,225,479	129,637	5,135,915	2,572,895	1.470	.476	.050	1.996
Illinois	10,728,534		856,342	869,773	12,454,649	6,035,333	1.778	.142	.144	2.064
Indiana	12,403,128	115,089	1,196,887	619,414	14,334,518	7,018,237	1.784	.171	.088	2.043
Kentucky	1,235,705		42,618	195,645	1,473,968	753,855	1.639	.057	.260	1.956
Maryland	884,156	4,426,850	566,063	553,937	6,431,006	3,525,694	1.506	.161	.157	1.824
Massachusetts	199,924	48,123		9,753	257,800	147,511	1.682		.066	1.748
Michigan	3,163,027		476,609	297,771	3,937,407	2,189,696	1.444	.218	.136	1.798
Minnesota	1,223,753			98,044	1,321,797	639,774	1.913		.153	2.066
New York	6,107,720	43,476	1,266,553	659,366	8,077,115	4,154,039	1.481	.305	.159	1.945
Ohio	17,727,614	691,157	3,644,476	2,160,182	24,223,429	12,510,703	1.472	.291	.173	1.936
Pennsylvania	23,833,548	746,373	6,926,291	3,397,435	34,903,647	18,239,608	1.348	.380	.186	1.914
Tennessee, West Virginia	2,322,595	135,253	107,725	170,217	2,735,790	1,704,844	1.442	.063	.100	1.605
Total	91,600,306	6,635,420	18,766,333	9,538,226	126,540,285	64,499,983	1.523	.291	.148	1.962

[1] Excludes recycled materials.

PRODUCTION OF STEEL

Steel production rose to 96,836,075 net tons in 1950, an increase of 24 percent over 1949, and steel capacity increased 4 percent. According to the American Iron and Steel Institute, average annual capacity as of January 1 and July 1, 1950, was 99,982,650 net tons. Of the total tonnage of steel ingots and castings produced in the United States in 1950, 89 percent was made in open-hearth furnaces as compared with 90 percent in 1949 and 90 percent in 1948; 5 percent was made in Bessemer converters, and 6 percent was made in electric furnaces compared with 5 percent in 1949.

In 1950, 38.8 percent of the domestic steel output was made by furnaces in the Pittsburgh-Youngstown district, 21.6 percent in the Chicago district, 19.4 percent in the Eastern district, 9.6 percent in the Cleveland-Detroit district, 5.6 percent in the Western district, and 5.0 percent in the Southern district, compared with 38.7, 22.0, 19.8, 9.0, 5.5, and 5.0 percent, respectively, in 1949.

The data concerning steel production used by the Bureau of Mines are furnished by the American Iron and Steel Institute. The output from steel foundries that do not produce steel ingots is not included in the production data.

Alloy Steel.—The steel output for 1950 included 8,570,105 net tons of alloy steel ingots and castings. This figure represents a sharp increase in alloy-steel production over 1949, when there was a slump, but is only slightly higher than that for 1948. Alloy production represents 9 percent of the total steel compared with 8 percent in 1949 and 10 percent in 1948. The alloy-steel data include steels in which the minimum of the range specified, in one or more of the elements named, exceeds the following percentages: Manganese, 1.65 percent; silicon, 0.60 percent; copper, 0.60 percent; or aluminum, boron, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, and other alloying elements, any added percent. The output of alloy steel in 1950 increased 45 percent over 1949 compared with the total steel increase of 24 percent. Of the alloy steel produced in 1950, 67 percent was made in basic open-hearth furnaces, 1.4 percent in acid open-hearths, and 31.6 percent in electric furnaces; none was produced in Bessemer converters. The percentage of alloy steel made in electric furnaces in 1949 was 27.

TABLE 7.—Steel capacity, production, and percent of operations, 1946–50, in net tons [1]

[American Iron and Steel Institute]

Year	Annual capacity as of Jan. 1	Production					
		Open hearth	Bessemer	Crucible	Electric	Total	Percent of capacity
1946	91,890,560	60,711,963	3,327,737	(2)	2,563,024	66,602,724	72.5
1947	91,241,250	76,873,793	4,232,543	18	3,787,717	84,894,071	93.0
1948	94,233,460	79,340,157	4,243,172	(2)	5,057,141	88,640,470	94.1
1949	96,120,930	70,248,803	3,946,656	(2)	3,782,717	77,978,176	81.1
1950	99,392,800	86,262,509	4,534,558	(2)	6,039,008	96,836,075	96.9

[1] The figures include only that portion of the capacity and production of steel for castings used by foundries which were operated by companies producing steel ingots. Omitted portion is about 2 percent of total steel production.

[2] Included with "Electric."

TABLE 8.—Open-hearth steel ingots and castings manufactured in the United States, 1946–50, by States, in net tons [1]

[American Iron and Steel Institute]

State	1946	1947	1948	1949	1950
New England States	367,868	428,651	454,524	381,763	485,007
New York and New Jersey	3,242,138	4,213,369	4,277,040	4,020,711	4,820,177
Pennsylvania	17,495,219	22,911,984	23,648,314	19,759,983	24,610,259
Ohio	11,446,783	14,026,978	14,045,722	12,215,389	15,200,938
Indiana	8,359,305	10,128,496	10,453,975	9,099,413	11,055,043
Illinois	4,851,975	6,206,370	6,269,723	5,886,460	6,831,337
Other States	14,948,675	18,957,945	20,190,859	18,885,084	23,259,748
Total	60,711,963	76,873,793	79,340,157	70,248,803	86,262,509

[1] Includes only that portion of steel for castings produced in foundries operated by companies manufacturing steel ingots. *See* table 7.

TABLE 9.—Bessemer-steel ingots and castings manufactured in the United States, 1946–50, by States, in net tons [1]

[American Iron and Steel Institute]

State	1946	1947	1948	1949	1950
Ohio	1,447,825	1,981,428	1,936,873	1,760,006	2,000,294
Pennsylvania	1,143,388	1,345,412	1,355,934	1,174,866	1,293,746
Other States	736,524	905,703	950,365	1,011,784	1,240,518
Total	3,327,737	4,232,543	4,243,172	3,946,656	4,534,558

[1] Includes only that portion of steel for castings produced in foundries operated by companies manufacturing steel ingots. *See* table 7.

TABLE 10.—Steel electrically manufactured in the United States, 1945–50, in net tons [1]

[American Iron and Steel Institute]

Year	Ingots	Castings	Total	Year	Ingots	Castings	Total
1945	3,381,678	75,026	3,456,704	1948	4,973,611	83,530	[2] 5,057,141
1946	2,479,064	83,960	[2] 2,563,024	1949	3,687,077	95,640	[2] 3,782,717
1947	3,680,500	107,217	3,787,717	1950	5,927,509	111,499	[2] 6,039,008

[1] Includes only that portion of steel for castings produced in foundries operated by companies manufacturing steel ingots. *See* table 7.
[2] Includes a very small quantity of crucible steel.

TABLE 11.—Alloy-steel ingots and castings manufactured in the United States, 1946–50, by processes, in net tons [1]

[American Iron and Steel Institute]

Process	1946	1947	1948	1949	1950
Open hearth:					
Basic	4,325,657	5,520,540	6,285,054	4,192,344	5,738,067
Acid	115,711	128,754	128,915	105,550	123,253
Crucible } Electric }	1,635,827	1,778,937	2,067,145	1,599,675	2,708,785
Total	6,077,195	7,428,231	8,481,114	5,897,569	8,570,105

[1] Includes only that portion of steel for castings produced in foundries operated by companies manufacturing steel ingots. *See* table 7.

Electric furnaces produced proportionately more alloy steels in 1950 than in 1949; 45 percent of the steel made in electric furnaces was alloy compared with 42 percent in the previous year. Typically, steels with high alloy content are made in electric furnaces and steels with lower alloy content by the open-hearth process.

Metalliferous Materials Used.—During 1950 steel furnaces used 3,495,862 tons of domestic iron ore and 1,799,089 tons of foreign ore; the latter originated in Africa, Brazil, Canada, and Sweden. Also used were 1,310,471 tons of sinter made from both foreign and domestic ores. Scrap and pig iron used in steel furnaces in 1950 totaled 107.4 million net tons; of this total, 52 percent was pig iron, 26 percent home scrap, and 22 percent purchased scrap. Both charge ore and feed ore are employed in the basic open-hearth process. Charge ore is used to add oxygen to the charge before it is melted. This ore should be low in combined and uncombined moisture, silica, and fines. Ore with a high silica content requires large additions of limestone and consequently produces large volumes of slag, which reduces furnace efficiency. Iron-ore sinter has been found to be a good charge ore in open-hearth practice.

Feed ore, which is added to the heat during the working period, should be hard, dense, coarse, and low in moisture. Although moderately high silica ore can be used as feed, it is undesirable as a charge ore because of the large quantity of slag resulting. Lump ore, which is preferred as a feed ore, is high-priced, and the supply is limited. The Vermilion range in Minnesota, the Marquette range in Michigan, and districts in New York and New Jersey are the large sources of this grade in the United States. Recently, large tonnages of high-grade lump ore have been obtained from Brazil, and Liberia is expected to begin shipments in 1951.

TABLE 12.—Metalliferous materials consumed in steel furnaces in the United States, 1946–50, in net tons

Year	Iron ore		Sinter	Manganese ore		Pig iron	Ferro-alloys	Iron and steel scrap	
	Domestic	Foreign		Domestic	Foreign			Home	Purchased
1946	3,117,774	446,611	769,640	2,364	2,110	38,443,934	1,044,000	19,868,551	16,513,487
1947	3,795,886	809,191	1,134,542	2,080	3,512	50,177,381	1,250,000	23,993,919	20,791,449
1948	3,808,155	1,064,513	1,114,032	2,698	4,159	52,177,785	1,300,000	24,689,529	22,890,571
1949	3,152,797	1,107,625	1,051,746	1,231	3,033	46,502,503	950,000	22,675,212	17,753,002
1950	3,495,862	1,799,089	1,310,471	2,877	1,335	56,269,610	1,320,000	27,353,503	23,738,078

CONSUMPTION OF PIG IRON

Consumption of pig iron in 1950 increased 22 percent over 1949. Pig iron, a product of the blast furnace, is a semiraw material; except for a small quantity used in direct castings, it moves to steel-making or iron-melting furnaces for refining, alone or mixed with other ingredients. In 1950, 86 percent of the pig iron went to the steel-making furnaces (open-hearth, Bessemer, and electric) to be processed into steel. Direct castings took 4 percent, and the remaining 10 percent was consumed in iron-making furnaces, of which the cupola is the most important.

TABLE 13.—Consumption of pig iron in the United States, 1947–50, by type of furnace

Type of furnace or equipment	1947		1948		1949		1950	
	Net tons	Percent of total	Net tons	Percent of total	Net tons	Percent of total	Net tons	Percent of total
Open-hearth	45, 338, 462	77. 8	47, 267, 334	78. 8	41, 782, 506	78. 2	50, 946, 134	78. 5
Bessemer	4, 711, 581	8. 1	4, 778, 137	8. 0	4, 612, 408	8. 6	5, 169, 835	8. 0
Electric	127, 338	. 2	132, 314	. 2	107, 589	. 2	153, 641	. 2
Cupola	5, 438, 727	9. 3	5, 280, 957	8. 8	4, 764, 003	8. 9	6, 059, 188	9. 3
Air Brackelsberg	413, 900	. 7	368, 003	. 6	273, 514	. 5	334, 613	. 5
Crucible	1, 312	(1)	1, 013	(1)	1, 052	(1)	1, 190	(1)
Puddling	16, 573	(1)	14, 979	(1)	3, 880	(1)	3, 168	(1)
Direct castings	2, 241, 789	3. 9	2, 183, 572	3. 6	1, 901, 760	3. 6	2, 275, 349	3. 5
Miscellaneous	1, 073	(1)	95	(1)	53	(1)	(1)	(1)
Total	58, 290, 755	100. 0	60, 026, 404	100. 0	53, 446, 765	100. 0	64, 943, 118	100. 0

[1] Less than 0.05 percent.

TABLE 14.—Consumption of pig iron in the United States, 1946–50, by States and districts

State and district	1946		1947		1948		1949		1950	
	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons
Connecticut	55	88, 307	58	92, 114	59	73, 173	56	56, 835	54	75, 868
Maine	16	10, 267	15	14, 111	15	14, 882	11	10, 304	13	9, 657
Massachusetts	94	154, 654	98	199, 258	100	219, 453	95	174, 401	101	218, 931
New Hampshire	15	5, 992	16	5, 771	16	4, 178	15	3, 252	16	4, 190
Rhode Island	10	28, 339	12	31, 036	11	23, 520	11	32, 217	15	41, 223
Vermont	12	9, 411	14	10, 007	14	7, 687	13	6, 328	13	8, 783
Total New England	202	296, 970	213	352, 297	215	342, 893	201	283, 337	212	358, 652
Delaware	7	292, 498	7	312, 845	7	374, 384	7	317, 516	6	365, 985
New Jersey [1]	77		76		80		78		73	
New York	179	2, 201, 586	172	2, 966, 882	174	2, 948, 785	170	2, 652, 854	163	3, 060, 001
Pennsylvania [1]	354	13, 120, 922	349	17, 287, 166	401	17, 667, 350	390	14, 834, 486	347	18, 315, 008
Total Middle Atlantic	617	15, 615, 006	604	20, 566, 893	662	20, 990, 519	645	17, 804, 856	589	21, 740, 994
Alabama	66	2, 568, 276	69	3, 356, 612	74	3, 500, 614	72	3, 152, 311	79	3, 777, 495
District of Columbia	1		1		3		2		1	
Kentucky [1]	24	2, 629, 314	24	3, 150, 317	25	3, 640, 266	22	3, 593, 087	22	4, 347, 710
Maryland [1]	21		19		23		21		18	
Florida	17	63, 613	14	37, 525	15	38, 565	14	70, 171	13	86, 243
Georgia	52		49		51		50		49	
Mississippi	8	2, 256	8	2, 596	8	2, 271	8	1, 293	8	1, 166
North Carolina	50	28, 423	47	27, 466	44	20, 482	45	20, 958	52	30, 658
South Carolina	17	7, 348	16	9, 169	14	9, 404	14	7, 360	16	11, 424
Tennessee	52	197, 055	53	254, 202	53	265, 838	50	213, 323	51	282, 580
Virginia	53		54		51		49		49	
West Virginia	25	1, 115, 785	25	1, 379, 112	26	1, 585, 755	23	1, 600, 150	22	1, 869, 337
Total Southeastern	386	6, 612, 070	379	8, 216, 999	387	9, 063, 195	370	8, 658, 653	380	10, 406, 613
Arkansas	4		4		4		3		5	
Louisiana	12	5, 620	11	5, 766	12	7, 025	12	6, 015	11	7, 280
Oklahoma	10		9		9		11		15	
Texas	37	54, 138	37	120, 091	38	230, 947	37	198, 318	45	356, 724
Total South Central	63	59, 758	61	125, 857	63	237, 972	63	204, 333	76	364, 004

For footnote, see end of table.

TABLE 14.—Consumption of pig iron in the United States, 1946–50, by States and districts—Continued

State and district	1946		1947		1948		1949		1950	
	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons	Consumers	Net tons
Illinois [1]	208	3,716,293	208	4,782,722	216	4,809,697	209	4,498,693	204	5,465,752
Indiana	126	5,356,288	128	6,810,122	137	7,075,885	135	6,303,356	132	7,480,127
Iowa	58	104,744	54	98,116	50	91,291	52	107,353	54	101,702
Kansas	24	16,901	22	14,041	25	24,410	24	16,624	21	16,887
Nebraska	11		11		11		11		10	
Michigan	173	2,275,887	167	2,737,764	167	2,979,528	169	2,932,925	171	3,983,516
Wisconsin	115		116		125		121		123	
Minnesota	61	443,861	59	445,584	58	458,139	54	383,691	59	541,493
Missouri	52	93,298	51	80,926	51	87,654	49	63,524	45	86,939
North Dakota	1	316	1	225	1	235	1	261	2	608
South Dakota	1		1		1		1		2	
Ohio [1]	297	9,162,118	299	11,674,075	327	11,633,581	319	10,134,409	283	11,667,857
Total North Central	1,127	21,169,706	1,117	26,643,575	1,169	27,160,420	1,145	24,440,836	1,106	29,344,881
Arizona, Nevada, New Mexico	5	1,022	4	1,215	4	1,251	4	1,194	3	1,520
Colorado, Utah	26	761,468	26	1,511,704	30	1,583,437	31	1,364,097	25	1,766,874
Idaho	4	1,547	5	3,041	2	315	2	194	2	167
Wyoming					2	4	2	5	2	4
Montana					4	320	4	305	3	207
Total Rocky Mountain	35	764,037	35	1,515,960	42	1,585,327	43	1,365,795	35	1,768,772
Oregon	32	33,795	26	17,812	23	20,849	23	15,342	24	21,462
Washington	31		31		29		35		28	
California [1]	123	520,288	116	635,164	111	625,229	108	673,613	105	937,740
Total Pacific Coast	186	554,083	173	652,976	163	646,078	166	688,955	157	959,202
Undistributed [1]	-----	----------	7	216,198	-----	----------	-----	----------	-----	----------
Total United States	2,616	45,071,630	2,589	58,290,755	2,701	60,026,404	2,633	53,446,765	2,555	64,943,118

[1] In 1947 some pig iron consumed in California, Illinois, Kentucky, Maryland, New Jersey, Ohio, and Pennsylvania—not separable—is included with "Undistributed."

Plants using pig iron in 1950 were located in all 48 States and the District of Columbia, but consumption is concentrated largely in the steel-making centers of the North Central, Middle Atlantic, and the Southeastern States.

PRICES

The average value of all grades of pig iron given in the accompanying table is compiled from producers' reports to the Bureau of Mines. The figures represent value f. o. b. blast furnaces and do not include the value of ferro-alloys. The general average value for all grades of pig iron at furnaces was $42.85 in 1950 compared with $42.05 in 1949.

TABLE 15.—Average value per net ton of pig iron at blast furnaces in the United States, 1946–50, by States

State	1946	1947	1948	1949	1950
Alabama	$21.15	$28.12	$36.52	$35.79	$39.00
California, Colorado, and Utah	21.25	30.50	40.93	42.92	44.52
Illinois	25.17	30.97	35.72	41.69	42.77
Indiana	25.46	30.57	37.86	41.26	42.43
Michigan	27.19	(1)	(1)	(1)	(1)
New York	22.82	27.54	32.70	43.81	42.68
Ohio	24.90	30.87	37.98	40.92	42.38
Pennsylvania	24.70	30.23	36.68	43.04	43.09
Other States [2]	24.95	31.67	38.77	44.59	44.73
Average for United States	24.49	30.34	37.17	42.05	42.85

[1] Included with "Other States."
[2] Comprises Kentucky, Maryland, Massachusetts, Michigan (1947–50 only), Minnesota, Tennessee, Texas, Virginia, and West Virginia.

The average monthly prices of foundry, Bessemer, and basic pig iron at Mahoning Valley furnaces and foundry pig at Birmingham furnaces, according to published market quotations, are summarized in table 16.

TABLE 16.—Average monthly prices per net ton of chief grades of pig iron, 1949–50

[Metal Statistics, 1951]

Month	Foundry pig iron at Birmingham furnaces		Foundry pig iron at Valley furnaces		Bessemer pig iron at Valley furnaces		Basic pig iron at Valley furnaces	
	1949	1950	1949	1950	1949	1950	1949	1950
January	$38.73	$35.16	$41.52	$41.52	$41.96	$41.96	$41.07	$41.07
February	38.73	37.39	41.52	41.52	41.96	41.96	41.07	41.07
March	38.73	37.84	41.52	41.52	41.96	41.96	41.07	41.07
April	38.73	37.84	41.52	41.52	41.96	41.96	41.07	41.07
May	35.16	37.84	41.52	41.52	41.96	41.96	41.07	41.07
June	35.16	37.84	41.52	41.52	41.96	41.96	41.07	41.07
July	35.16	37.84	41.52	41.52	41.96	41.96	41.07	41.07
August	35.16	37.84	41.52	41.52	41.96	41.96	41.07	41.07
September	35.16	38.46	41.52	42.19	41.96	42.63	41.07	41.74
October	35.16	40.96	41.52	44.20	41.96	44.64	41.07	43.75
November	35.16	40.96	41.52	44.20	41.96	44.64	41.07	43.75
December	35.16	43.24	41.52	46.61	41.96	47.05	41.07	46.16
Average	36.35	38.60	41.52	42.45	41.96	42.89	41.07	42.00

TABLE 17.—Composite prices of finished steel in the United States, 1943–50, by months, in cents per pound

[Iron Age]

Month	1943	1944	1945	1946	1947	1948	1949	1950
January	2.396	2.396	2.412	2.464	2.877	3.193	3.720	3.837
February	2.396	2.396	2.427	2.555	2.884	3.125	3.719	3.837
March	2.396	2.396	2.432	2.719	2.884	3.241	3.715	3.837
April	2.396	2.396	2.433	2.719	2.884	3.241	3.709	3.837
May	2.396	2.396	2.436	2.719	2.884	3.214	3.706	3.837
June	2.396	2.396	2.464	2.719	2.884	3.211	3.705	3.837
July	2.396	2.396	2.464	2.719	2.914	3.293	3.705	3.837
August	2.396	2.396	2.464	2.719	3.193	3.720	3.705	3.837
September	2.396	2.396	2.464	2.719	3.193	3.720	3.705	3.837
October	2.396	2.396	2.464	2.719	3.193	3.720	3.705	3.837
November	2.396	2.396	2.464	2.719	3.193	3.720	3.705	3.837
December	2.396	2.396	2.464	2.747	3.193	3.720	3.756	4.131
Average	2.396	2.396	2.449	2.686	3.014	3.434	3.713	3.862

FOREIGN TRADE[3]

The increased demand for steel at home led to a marked increase in imports of both pig iron and steel from abroad and a decrease in exports in 1950. Imports of pig iron increased nearly eightfold (from 99,804 net tons in 1949 to 795,965 tons in 1950), and imports of steel (manufactures and semimanufactures) rose from 304,604 net tons to 1,095,571 tons. Exports of pig iron dropped from 81,309 net tons ($3,353,602) in 1949 to 6,813 tons ($321,975) in 1950 and steel, from 3,517,971 net tons to 2,566,473 tons.

Largest quantities of pig iron came from the Netherlands, Germany, and Canada, with Austria and France following in order.

Imports and exports of iron and steel products are given in detail in tables 19 and 20. Imports of semimanufactures increased more than that of manufactures between 1949 and 1950. The largest item in manufactures was structural iron and steel and in semimanufactures, "boiler and other plate iron and steel, n. e. s."

TABLE 18.—Pig iron imported for consumption in the United States, 1946–50, by countries, in net tons

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
North America:					
Canada	1,287	1,747	5,729	12,270	187,533
Mexico	11,248	1,004			
South America:					
Argentina			2		
Brazil			551		
Chile					7,583
Europe:					
Austria		281	19,145	5,145	56,635
Belgium-Luxembourg			33,147	15,688	8,086
France			17,876	340	37,640
Germany			24,558	2,383	224,684
Italy			5,001		
Netherlands		2,711	[1] 45,020	20,527	243,322
Norway		9,482	23,919	146	5,364
Poland-Danzig		7,466			
Sweden	28		1,301	436	14,798
U. S. S. R.		1,357			
United Kingdom	1,528	8,576		193	2,816
Asia: India			16,101	23,077	7,168
Africa: Union of South Africa					336
Oceania: Australia			26,902	19,599	
Total: Net tons	14,091	32,624	[1] 219,252	99,804	795,965
Value	$492,519	$1,738,812	[1]$11,810,853	$4,591,779	$25,874,192

[1] Revised figure.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 19.—Major iron and steel products imported for consumption in the United States, 1948–50

[U. S. Department of Commerce]

Products	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
Semimanufactures:						
Steel bars:						
Concrete reinforcement bars	790	$79,008	10,269	$1,254,076	60,421	$3,612,285
Solid or hollow, n. e. s	5,007	527,480	35,268	3,007,463	108,417	6,422,690
Hollow and hollow drill steel	63	15,148	92	21,438	799	196,267
Bar iron	191	38,825	353	80,200	387	58,826
Wire rods, nail rods, and flat rods up to 6 inches in width	6,607	1,045,595	5,732	27,926	112,298	7,337,686
Boiler and other plate iron and steel, n. e. s	21,735	2,145,259	30,519	2,988,108	162,319	13,722,706
Steel ingots, blooms, and slabs	17,885	969,595	50,310	3,312,902	115,384	6,738,677
Billets, solid or hollow	5,399	441,416	2,002	165,969	65,136	4,041,694
Die blocks or blanks, shafting, etc	48	16,475	660	61,626	12,211	780,128
Circular saw plates	5	3,090	2	1,016	16	13,860
Sheets of iron or steel, common or black and boiler or other plate iron or steel	8,601	1,210,420	3,572	396,433	27,301	2,579,819
Sheets and plates and steel, n. s. p. f	3,988	409,026	9,266	865,110	33,105	2,806,846
Tin plate, terneplate, and taggers' tin	207	74,631	13,684	2,052,030	4,289	687,562
Total semimanufactures	70,526	6,975,968	161,729	14,234,297	702,083	48,999,046
Manufactures:						
Structural iron and steel	65,830	6,565,705	119,506	11,895,706	177,859	12,118,578
Rails for railways	5,063	266,032	944	76,459	6,564	318,545
Rail braces, bars, fishplates, or splice bars and tie plates	1,721	66,200	162	16,452	295	25,283
Pipes and tubes:						
Cast-iron pipe and fittings	1,981	341,206	256	39,823	1,215	119,756
Other pipes and tubes	2,561	290,966	5,459	1,154,349	40,495	4,724,099
Wire:						
Barbed	(1)	24	100	11,653	9,505	1,008,545
Round wire, n. e. s	25	14,482	2,308	245,907	17,829	1,808,094
Telegraph, telephone, etc., except copper, covered with cotton jute, etc	2	2,337	456	241,344	214	76,355
Flat wire and iron or steel strips	2,125	1,907,705	1,574	1,598,381	8,088	1,998,968
Rope and strand	280	107,963	891	380,756	2,305	721,151
Galvanized fencing wire and wire fencing	(1)	53	7	786	1,367	136,107
Hoop or band iron or steel, for baling	545	53,615	[2] 2,985	284,033	17,885	1,574,263
Hoop, band and strips, or scroll iron or steel, n. s. p. f	2,445	276,344	5,647	511,081	41,540	2,682,177
Nails	2,045	459,691	2,384	429,188	67,524	7,189,462
Castings and forgings, n. e. s	660	197,245	196	67,149	803	177,518
Total manufactures	85,283	10,549,568	[2] 142,875	16,953,067	393,488	34,678,901
Grand total	155,809	17,525,536	[2] 304,604	31,187,364	1,095,571	83,677,947

[1] Less than 0.5 ton.
[2] Revised figure.

TABLE 20.—Major iron and steel products exported from the United States, 1948–50

[U. S. Department of Commerce]

Products	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
Semimanufactures:						
Steel ingots, blooms, billets, slabs, and sheet bars	219,340	$16,737,092	257,248	$21,546,322	61,612	$4,962,518
Iron and steel bars and rods:						
Iron bars	3,659	533,323	1,470	322,745	1,006	164,924
Concrete reinforcement bars	130,298	12,804,067	107,902	10,386,873	18,589	1,820,988
Other steel bars	408,977	47,285,914	332,387	39,949,878	99,245	13,201,530
Wire rods	38,143	3,763,553	53,315	5,019,109	6,264	596,163
Iron and steel plates, sheets, skelp, and strips:						
Plates, including boiler plate, not fabricated	347,697	33,447,860	417,097	41,542,588	112,225	12,111,005

TABLE 20.—Major iron and steel products exported from the United States, 1948–50—Continued

[U. S. Department of Commerce]

Products	1948		1949		1950	
	Net tons	Value	Net tons	Value	Net tons	Value
Semimanufactures—Continued						
Skelp iron and steel	57, 920	$3, 370, 867	117, 369	$8, 467, 977	116, 581	$8, 720, 436
Iron and steel sheets, galvanized	62, 782	8, 211, 687	85, 594	13, 071, 223	100, 361	16, 663, 184
Steel sheets, black, ungalvanized	416, 481	57, 396, 092	551, 245	74, 987, 636	503, 403	68, 277, 782
Iron sheets, black	17, 773	2, 008, 229	22, 650	2, 638, 541	17, 046	2, 086, 764
Strip, hoop, band, and scroll iron and steel:						
Cold-rolled	59, 483	12, 405, 506	57, 376	12, 591, 131	43, 289	10, 553, 658
Hot-rolled	69, 094	7, 569, 374	82, 376	9, 224, 040	49, 592	5, 598, 381
Tin plate and terneplate	613, 785	97, 102, 604	558, 173	95, 662, 968	496, 107	81, 735, 108
Total semimanufactures	2, 445, 432	302, 636, 168	2, 644, 202	335, 411, 031	1, 625, 320	226, 492, 441
Manufactures—steel-mill products:						
Structural iron and steel:						
Water, oil, gas, and other storage tanks complete and knocked-down material	92, 448	15, 327, 353	106, 003	19, 037, 149	39, 147	8, 441, 499
Structural shapes:						
Not fabricated	292, 176	23, 388, 444	302, 700	25, 680, 402	153, 570	13, 800, 340
Fabricated	161, 504	38, 014, 226	1 152, 894	1 36, 483, 622	110, 348	27, 957, 015
Plates, fabricated, punched, or shaped	23, 551	3, 728, 580	1 30, 328	1 6, 295, 963	7, 370	1, 733, 857
Metal lath	7, 233	1, 661, 125	5, 166	1, 259, 732	3, 000	805, 043
Frame, sashes, and sheet piling	38, 253	4, 792, 560	22, 501	3, 793, 458	12, 264	1, 934, 753
Railway-track material:						
Rails for railways	308, 375	22, 822, 159	236, 990	19, 416, 144	137, 391	10, 105, 145
Rail joints, splice bars, fishplates, and tie plates	49, 356	5, 085, 002	22, 680	3, 100, 755	23, 649	2, 791, 794
Switches, frogs, and crossings	5, 467	1, 430, 134	6, 043	1, 674, 188	2, 505	696, 517
Railroad spikes	9, 268	1, 283, 138	3, 634	544, 619	7, 516	1, 064, 531
Railroad bolts, nuts, washers, and nut locks	7, 666	1, 852, 157	1, 994	508, 375	1, 600	371, 125
Tubular products:						
Boiler tubes	38, 455	7, 784, 355	1 47, 168	1 9, 798, 567	15, 541	3, 760, 427
Casing and line pipe	371, 914	48, 626, 644	1 492, 929	1 72, 067, 360	452, 065	61, 850, 443
Seamless black pipe and tubes and other line and boiler pipe and tubes, except casing	21, 692	3, 377, 439	1 25, 782	1 4, 251, 542	17, 328	3, 112, 500
Welded black pipe and tubes	61, 560	9, 700, 712	101, 766	15, 710, 248	59, 881	8, 369, 201
Welded galvanized pipe and tubes	41, 761	7, 944, 365	98, 536	17, 826, 791	64, 990	10, 683, 312
Malleable-iron screwed pipe fittings	4, 490	3, 327, 067	1 5, 522	1 4, 037, 896	4, 105	2, 743, 592
Cast-iron screwed pipe fittings	2, 650	906, 486	752	294, 867	620	274, 257
Cast-iron pressure pipe and fittings	32, 066	3, 823, 795	1 47, 828	1 5, 669, 993	21, 179	2, 538, 927
Cast-iron soil pipe and fittings	4, 568	904, 290	10, 165	1, 809, 149	5, 802	1, 014, 642
Iron and steel pipe and fittings, n. e. s.	68, 938	29, 075, 781	1 68, 685	1 32, 783, 594	39, 394	19, 301, 638
Wire and manufactures:						
Barbed wire	76, 827	11, 818, 185	75, 737	11, 666, 175	10, 976	1, 587, 017
Galvanized wire	50, 314	9, 426, 895	56, 902	9, 591, 071	11, 123	2, 023, 933
Iron and steel wire, uncoated	39, 789	6, 096, 728	73, 828	11, 524, 306	25, 936	5, 214, 337
Wire rope and strand	13, 643	4, 845, 673	12, 915	5, 286, 181	11, 632	4, 650, 253
Woven-wire fencing and screen cloth	17, 357	6, 983, 470	20, 615	7, 008, 457	8, 774	3, 205, 790
All other	57, 352	15, 733, 926	36, 191	10, 439, 244	24, 478	7, 559, 330
Nails and bolts, iron and steel, n. e. s.:						
Wire nails	19, 662	3, 358, 447	25, 910	4, 187, 757	3, 097	554, 609
All other nails, including tacks and staples	14, 914	4, 384, 450	11, 571	3, 178, 429	3, 717	1, 562, 514
Bolts, machine screws, nuts, rivets, and washers, n. e. s	54, 311	16, 908, 269	26, 129	12, 045, 325	16, 213	8, 595, 831
Castings and forgings:						
Horseshoes, mule shoes, and calks	582	112, 854	418	90, 463	340	62, 588
Iron and steel, including car wheels, tires, and axles	116, 763	19, 531, 742	1 135, 926	22, 580, 115	87, 491	14, 630, 082
Total manufactures	2, 104, 905	334, 056, 451	1 2, 266, 208	1 379, 641, 937	1, 383, 042	232, 996, 842
Advanced manufactures:						
House-heating boilers and radiators		854, 207		736, 209		784, 595
Oil burners and parts		3, 976, 851		4, 802, 112		5, 952, 281
Tools (iron and steel chief value)		1 52, 537, 253		1 46, 974, 002		31, 691, 288
Total advanced manufactures		1 57, 368, 311		1 52, 512, 323		38, 428, 164

1 Revised figure.

WORLD PRODUCTION

World production of pig iron (including ferro-alloys) increased 15 percent and world production of steel, 17 percent. United States steel production was 47 percent of world production. The U. S. S. R., the world's second largest producer, produced 14.5 percent of the world's steel and Germany (Federal Republic), the third largest producer, 6.5 percent.

Argentina.—The Sociedad Mixta Siderurgica was reported soon to begin the erection of a blast furnace with a daily capacity of 1,200 tons, four open-hearth furnaces with capacities of 160 tons each, and a rolling mill with a yearly output of 250,000 tons. Finished products were to include rails and plates.[4]

Chile.—The blast furnace of Cia. Acero del Pacifico, near Talcahuano, began producing pig iron in June 1950. This was the first pig iron produced in Chile in a blast furnace employing coke as fuel. Cia. Acero del Pacifico's $90,000,000 mill is designed to produce 200,000 metric tons of steel per year—practically all the steel needs of Chile. It was built under the technical direction of Koppers, Ltd., and financed with $45,000,000 from the Export-Import Bank.[5]

Egypt.—Bids were received for the construction of a modern steel plant, with an annual capacity of 150,000 metric tons, at Aswan. The operating corporation was to be privately owned, with substantial Government participation, the foreign construction company being required to hold shares to guarantee the project.[6]

France.—The Lorraine district's 15 steel plants have been expanded greatly in the past 2 years with the aid of ECA funds. There were 9 new rolling mills and 75 operating furnaces, of which 25 had been rebuilt, with capacity increased by the end of 1950.[7]

Germany: Federal Republic.—In October 1950 the Federal Ministry of Economy began negotiations with the High Commission to hold the steel quota of 11.1 million tons exclusively for domestic requirements. Steel orders increased from 1.84 million tons in May to 2.4 million tons in September. The Federal Ministry of Economy believed that an annual production of 13 to 13.5 million tons was required to supply the steel needs of Western Germany.[8]

Germany: Soviet Zone.—Developments were reported as follows:[9]

Although the iron and steel industry (excluding armaments) was more thoroughly dismantled than any other in the Soviet Zone, it has been more intensely reconstructed than any other industry.

The largest individual iron and steel group in the Soviet Zone was the Flick Co., which included the Maximilianhuette in Unterwellenborn (with the only blast furnaces in the Zone), the Mitteldeutschen Stahlwerke in Riesa, Lauchhammer, Torgau, and Groeditz, Weber in Brandenburg, the Stahlwerke Henningsdorf, with the Spandauer plants and the steel casting plant at Doehlen. In addition to the Flick Co., there were the Thale Works, Krupp-Gruson in Magdeburg, Tangerhuette, and O. Kuntsch in Zeitz and Silbitz. East of the Oder-Neisse line, almost all of the iron and steel works belonged to the Vereinigten Oberschlesischen

---

[4] Metal Bulletin (London), No. 3494, May 23, 1950, p. 10.
[5] Engineering and Mining Journal, vol. 151, No. 8, August 1950, p. 166.
[6] Bureau of Mines, Mineral Trade Notes: Vol. 32, No. 1, January 1951, p. 15.
[7] Mining World, vol. 13, No. 4, April 1951, p. 49.
[8] Bureau of Mines, Mineral Trade Notes: Vol. 32, No. 1, February 1951, p. 12.
[9] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 2, February 1950, pp. 19-20.

Huettenwerken, which had production plants in Beuthen, Gleiwitz, Zawadski, Hindenburg, Malapane, and Laband.

All plants, with the exception of Unterwellenborn of the Flick Co., were completely dismantled. Dismantling of the Unterwellenborn plant ceased after it began, and the plant was taken over as a SAG (Soviet Joint Stock Co.) but later was returned to the Germans. Krupp-Gruson, the Eisenhuettenwerk Thale, and plants of O. Kuntsch remained Soviet joint stock companies.

Loss of real capital of the iron and steel industry in the Soviet Zone of Germany in millions of Reichmarks were 395 dismantled plants, 48 SAG plants, and 87 plants in operation.

Reconstruction of the iron and steel industry began in the middle of 1947 * * *. The production goal for 1950 (850,000 metric tons) was expected to be reached.

Reconstruction was centered at Unterwellenborn, the steel plants at Riesa and Henningsdorf, including the newly constructed rolling mill on the site of the former Reichbahn Repair Works in Kirchmoeser, and the new rolling mill in Burg. The Groeditz plants also were being rebuilt. Four plants in Ilsenburg, Auerhammer, Olbernhau, and Hettsedt, which formerly rolled nonferrous metals, were expanded and converted to produce steel plate.

India.—In January 1950 Foreign Commerce Weekly reported that the Government of India had granted the Steel Corp. of Bengal a loan of 50,000,000 rupees ($10,043,500) to be used in financing the expansion program of this company. The period of the loan was given as 3 years. It was expected to cover the first stage of the expansion program and to increase the company's annual production by 200,000 tons.[10]

Luxembourg.—During 1950 iron and steel production showed a progressive recovery, despite a coke shortage late in the year. The increase in output late in the year was accompanied by an increase in export prices.[11]

Mexico.—Plans to establish a large iron and steel plant between Saltillo and Arizpe, Coahuila, were made by the Mexican Government. To service southeastern Mexican and Central American markets, private interests were arranging to build and operate an iron and steel plant at the Port of Vera Cruz, Vera Cruz.[12]

Netherlands.—The Royal Dutch Blast Furnaces and Steel Co. planned to expand and modernize its property at a cost of about $47,000,000. Of this amount, $23,500,000 was granted by the United States. An increase of 25 to 50 percent in output of steel products was the aim of the project.[13]

Norway.—Production of electric pig iron was 61,093 metric tons, a decrease of 500 tons from 1949. Because of the European shortage of ferro-alloys, production capacity is being expanded. The increase in exports of ferro-alloys over 1949 was significant. The United States continued to be the principal importer of ferromanganese more than doubling its imports in part at the expense of Belgium-Luxembourg, the other large importer of this commodity.[14] Reports indicated that plant expansion was proceeding satisfactorily. Steel production at the rate of 80,000 tons per year was expected by the end of 1952.[15]

[10] Foreign Commerce Weekly, vol. 38, No. 3, Jan. 16, 1950, p. 29.
[11] Bureau of Mines, Mineral Trade Notes: Vol. 32, No. 5, May 1951, p. 21.
[12] Mining World, vol. 12, No. 1, January 1950, p. 46.
[13] Mining World, vol. 12, No. 2, February 1950, p. 50.
[14] Bureau of Mines, Mineral Trade Notes: Vol. 33, No. 2, August 1951, p. 17.
[15] Foreign Commerce Weekly, vol. 39, No. 7, May 15, 1950, p. 36.

Rumania.—Recent developments include the addition of a fifth open-hearth furnace at the Hunedoara iron works and the production of nodular cast iron (the first produced in Rumania) at a foundry at Ploeste. Another new foundry product recently introduced was synthetic cast iron made entirely from scrap.[16]

Spain.—According to preliminary figures, iron and steel output in 1950 was the highest since 1930. A government decree published in July 1950 provided for the construction of a steel plant in Asturias, with an annual capacity of 600,000 tons. A proposed production of 200,000 tons of steel ingots was to be increased to 600,000 tons over a 10-year period.[17]

Sweden.—Iron and steel output declined in the third quarter of 1950. Moreover, imports declined, owing to a sharp increase in prices asked by Belgian, West German, and other European mills. The Wiberg-Soderfors furnace installed by the Sandviken steel mill to produce sponge iron, which is expected to begin operating in 1951 or early 1952, will add another 20,000 tons to the present annual sponge-iron capacity of about 30,000 tons. A detailed description of the Wiberg sponge-iron process has been published.[18] A shipment of 200 tons of Venezuelan iron ore was received and tested by Soderfors Bruk to determine its suitability in the manufacture of sponge iron by the Wiberg process. The results were said to be so promising that a sponge-iron plant is to be built in Venezuela.[19] On the basis of the purchase of a large blast furnace from Austria, the Norrbottensjarnwerk Co. (Norbotten Iron Works) will increase the company's annual pig-iron production from 250,000 to 350,000 tons.[20]

Venezuela.—The Venezuelan Government made plans to build a steel plant at the junction of the Caroni and the Orinoco Rivers, near the El Pao iron mines. The plant was to be built with a yearly output of 70,000 tons, eventually to be increased to 2,000,000 tons. The entire project was expected to cost the Government about 400,000,000 bolivars ($120,000,000). Included in the plans are the dredging of the Orinoco River to allow passage of ocean-going vessels; erection of a large hydroelectric power plant at Caroni Falls, and the laying of a pipe to carry natural gas from the eastern (oil) wells to the steel plant.[21]

Yugoslavia.—Construction of a large steel plant at Gustanj (Slovenia) which will take several years to complete, was begun.[22]

---

16 Foreign Commerce Weekly, vol. 39, No. 8, May 22, 1950, p. 34.
17 Bureau of Mines, Mineral Trade Notes: Vol. 32, No. 5, May 1951, p. 22.
18 Industria (Sweden), Steel Shifts Emphasis: 1950, pp. 49–56, international ed. (in English).
19 Bureau of Mines, Mineral Trade Notes: Vol. 32, No. 1, January 1951, pp. 15–17.
20 Mining World, vol. 12, No. 3, March 1950, p. 54.
21 Mining World, vol. 13, No. 4, April 19, 1951, p. 51.
22 Mining World, vol. 12, No. 4, April 1950, p. 45.

TABLE 21.—World production of pig iron (including ferro-alloys), by countries, 1945–50, in thousands of metric tons [1]

[Compiled by Pauline Roberts]

Country [1]	1945	1946	1947	1948	1949	1950
Australia [2]	1,136	921	1,161	1,255	1,062	1,101
Austria	102	58	279	613	838	883
Belgium	735	2,161	2,817	3,929	3,749	3,693
Brazil	260	371	481	552	512	704
Canada	1,774	1,407	1,987	2,151	2,146	2,260
Chile	7	14	11	14	19	12
China	494	[3] 131	[3] 136	[3] 147	[3] 317	[3] 1,022
Czechoslovakia	576	961	1,422	1,660	1,875	1,883
Denmark	15	3	23	31	39	51
Finland	37	77	71	90	101	63
France	1,197	3,494	4,893	6,630	8,355	7,844
Saar	(4)	247	653	1,134	1,582	1,682
Germany:						
Federal Republic	[5] 1,123	2,330	2,512	4,662	7,140	9,480
Soviet zone	(6)	129	139	182	250	288
Hungary	[7] 44	160	299	403	428	[3] 500
India	1,425	1,481	1,567	1,494	1,671	1,689
Italy	71	205	384	526	445	570
Japan	984	212	367	836	1,625	2,286
Korea:						
North	141	[3] 10	[3] 20	(6)	(6)	(6)
South		----	----	----	----	(6)
Luxembourg	316	1,364	1,818	2,626	2,372	2,499
Mexico [8]	218	282	236	270	356	249
Netherlands	25	187	288	442	434	454
Norway	51	135	165	215	230	220
Poland	228	726	867	1,133	[3] 1,243	[3] 1,250
Rumania	54	66	90	[3] 80	[3] 200	[3] 243
Southern Rhodesia	----	----	----	17	38	38
Spain	488	509	517	537	634	680
Sweden	785	719	725	804	860	848
Switzerland	3	12	[3] 12	[3] 30	[3] 32	34
Turkey	70	79	99	166	113	116
Union of South Africa	556	560	630	651	708	733
U. S. S. R. [3]	8,730	10,000	11,200	14,100	16,700	19,500
United Kingdom	7,221	7,886	7,910	9,425	9,653	9,785
United States	49,856	42,023	54,559	56,214	49,775	60,217
Yugoslavia	12	84	163	172	191	[3] 210
Total (estimate)	79,000	79,000	100,000	113,000	116,000	133,000

[1] Pig iron is also produced in Argentina, Belgian Congo, Indonesia, New Zealand, and the Philippines, but quantity produced is believed insufficient to affect estimate of world total.
[2] Data for fiscal year ended June 30 of year stated.
[3] Estimate.
[4] Included with Germany.
[5] January, February, September–December inclusive, only.
[6] Data not available; estimate by author of chapter included in total.
[7] Data represent Trianon Hungary.
[8] Excluding ferro-alloy production, for which data are not available.

TABLE 22.—World production of steel ingots and castings, by countries, 1946–50, in thousands of metric tons

[Compiled by Pauline Roberts]

Country	1946	1947	1948	1949	1950
Australia [1]	1, 107	1, 363	1, 402	1, 183	1, 400
Austria	187	357	648	835	947
Belgium	2, 297	2, 882	3, 920	3, 849	3, 788
Brazil	343	387	483	605	764
Canada	2, 111	2, 673	2, 903	2, 894	3, 070
Chile	21	31	30	32	65
China	[2] 16	19	[2] 11	[2] 100	[2] 540
Czechoslovakia	1, 668	2, 286	2, 650	2, 510	2, 736
Denmark	52	58	72	76	123
Finland	90	81	109	114	105
France	4, 408	5, 733	7, 266	9, 108	8, 652
Saar	291	708	1, 228	1, 757	1, 896
Germany:					
Federal Republic	2, 840	3, 767	6, 784	9, 156	12, 121
Soviet zone	200	250	332	700	1, 155
Greece	----------	10	[2] 17	[2] 23	[2] 26
Hungary	353	597	742	849	1. 022
India	1, 314	1, 276	1, 276	1, 374	1, 437
Italy	1, 153	1, 691	2, 125	2, 055	2, 362
Japan	564	941	1, 714	3, 111	4. 848
Korea:					
North	15	[2] 50	(3)	(3)	(3)
South	(3)				
Luxembourg	1, 295	1, 714	2, 453	2, 272	2, 449
Mexico	251	322	269	345	[2] 320
Netherlands	143	203	342	437	490
Norway	53	65	63	72	70
Poland	1, 219	1, 579	1, 954	2, 305	(3)
Rumania	148	183	[2] 340	[2] 459	[2] 558
Spain	575	548	624	652	779
Sweden	1, 203	1, 191	1, 257	1, 370	1, 438
Switzerland	34	92	80	100	[2] 130
Turkey	80	93	99	103	90
Union of South Africa	507	598	597	632	755
U. S. S. R.[2]	13, 000	14, 000	18, 300	23, 000	27, 000
United Kingdom	12, 899	12, 929	15, 115	15, 803	16, 555
United States [4]	60, 421	77, 014	80, 413	70, 740	87, 848
Yugoslavia	202	311	367	399	[2] 420
Total (estimate)	111, 000	136, 000	156, 000	159, 000	186, 000

[1] Fiscal year ended June 30 of year stated.
[2] Estimate.
[3] Data not available.
[4] Data from American Iron and Steel Institute. Excludes production of castings by companies that do not produce steel ingots (about 2 percent of total steel production).

Iron and Steel Scrap

By James E. Larkin

GENERAL SUMMARY

RECORD production of steel ingots and castings in 1950 resulted in a 24-percent increase in the use of ferrous materials (scrap and pig iron) over 1949 and established an all-time record, exceeding 1948, the previous record year, by 7 percent. Consumption of both purchased and home scrap was the largest on record and represented 52 percent of the total charge. Pig-iron consumption also established a record high in 1950, showing a 22-percent increase over 1949 and exceeding 1948, the previous record year, by 4,916,714 short tons or 8 percent.

The proportions of scrap and pig iron used in steel furnaces in 1950—the same as in 1948—were 48 percent scrap and 52 percent pig iron, compared with 47 percent scrap and 53 percent pig iron in 1949. The charge of scrap and pig iron used in iron foundries, mainly cupola furnaces, comprised 65 percent scrap and 35 percent pig iron, the same as in 1949, but in 1948 these percentages were 67 and 33 percent, respectively.

The record use of purchased scrap during the year— a monthly average of 2,800,000 short tons—was accompanied by a new monthly record in October. May and October were the peak steel-producing months; 22 percent of the total charge in steel-making furnaces for these months was purchased scrap.

The increased consumption rate of purchased iron and steel scrap reduced stocks of this material held by consumers to a level 3 percent lower on December 31 than at the beginning of the year, equivalent to a 43-day supply at the 1950 average daily consumption rate of 91,144 short tons. These stocks reached a low of 3,196,000 short tons for the year at the end of April and a high of 4,138,000 short tons for the year at the end of October.

TABLE 1.—Salient statistics of ferrous scrap and pig iron in the United States, 1949–50

	1949 (short tons)	1950 (short tons)	Change from 1949 (percent)
Stocks, December 31: Ferrous scrap and pig iron at consumers' plants:			
Home scrap	1,564,054	1,469,463	−6
Purchased scrap	4,076,805	3,950,863	−3
Pig iron	1,657,634	1,800,137	+9
Total	7,298,493	7,220,463	−1
Consumption: Ferrous scrap and pig iron charged to—			
Steel furnaces: [1]			
Home scrap	22,675,212	27,353,503	+21
Purchased scrap	17,753,002	23,738,078	+34
Pig iron	46,502,503	56,269,610	+21
Total	86,930,717	107,361,191	+24
Iron furnaces: [2]			
Home scrap	6,435,943	8,116,435	+26
Purchased scrap	6,233,123	8,193,174	+31
Pig iron	6,944,209	8,673,508	+25
Total	19,613,275	24,983,117	+27
Miscellaneous uses [3] and ferro-alloy production:			
Home scrap	55,338	55,169	−0.3
Purchased scrap	1,185,605	1,444,916	+22
Pig iron	53		−100
Total	1,240,996	1,500,085	+21
All uses:			
Home scrap	29,166,493	35,525,107	+22
Purchased scrap	25,171,730	33,376,168	+33
Total ferrous scrap	54,338,223	68,901,275	+27
Pig iron	53,446,765	64,943,118	+22
Grand total	107,784,988	133,844,393	+24
Imports of scrap (including tin plate scrap)	[4] 1,151,294	777,886	−32
Exports of scrap:			
Iron and steel	294,960	208,775	−29
Tin plate, circles, strips, cobbles, etc	3,634	8,634	+138
Average prices per gross ton:			
Scrap:			
No. 1 Heavy-Melting, Pittsburgh [5]	$29.08	$39.29	+35
No. 1 Cast Cupola, Chicago [5]	[4] $39.00	$47.89	+23
For export	$27.54	$31.03	+13
Pig iron, f. o. b. Valley furnaces: [5]			
Basic	$46.00	$47.06	+2
No. 2 Foundry	$46.50	$47.58	+2

[1] Includes open-hearth, Bessemer, and electric furnaces.
[2] Includes cupola, air, Brackelsberg, puddling, crucible, and blast furnaces; also direct castings.
[3] Includes rerolling, reforging, copper precipitation, nonferrous, and chemical uses.
[4] Revised figure.
[5] Iron Age.

CONSUMPTION

The use of scrap and pig iron increased in every district during 1950, the total being 24 percent greater than in 1949. There was still a noticeably greater amount of scrap than pig iron used in the New England, Pacific Coast, and Southwestern districts. These districts together used 7 percent of the total scrap consumed in the United States and 3 percent of the pig iron, compared with 7 and 2 percent, respectively, in 1949. The average ratio of scrap to pig iron in these three districts was 2.8:1, whereas the United States average was 1.1:1.

Open-hearth furnaces continued to be the largest consumers of ferrous scrap and pig iron, increasing their consumption over that of 1949 by 7,989,567 tons of scrap and 9,163,628 tons of pig iron. Open-hearth consumption accounted for 63 percent of the total scrap in 1950 and 65 percent in 1949, 68 percent of the home scrap in 1950 and 71 percent in 1949, and 58 percent of the purchased scrap in 1950 and 59 percent in 1949. Pig-iron consumption in open hearths accounted for 78 percent of the total pig iron consumed in 1950, the same as in 1949.

Cupola-furnace consumption in 1950 was as follows: Home scrap, 15 percent of the total, the same as in 1949; purchased scrap, 16 percent, compared with 18 percent in 1949; pig iron, 9 percent, the same as for the 3 preceding years but 1 percent under 1946.

Bessemer converters consumed 8 percent of the pig iron during 1950, compared with 9 percent in 1949 and 8 percent for the 3 prevous years, and 0.4 percent of scrap, the same as for 1949 and 1948.

Electric furnaces consumed 11 percent of the total scrap, or 2 percent more than in 1949, and 0.2 percent of the pig iron, unchanged from 1947–48.

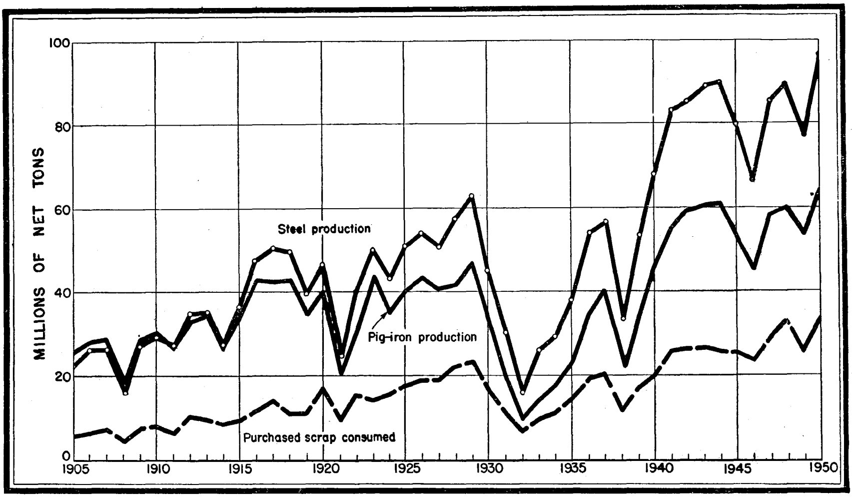

FIGURE 1.—Consumption of purchased scrap and output of pig iron and steel in the United States, 1905–50. Figures on consumption of purchased scrap for 1905–32 are from State of Minnesota vs. Oliver Iron Mining Co., et al., Exhibits, vol. 5, 1935, p. 328; those for 1933–34 are estimated by authors; and those for 1935–50 are based on Bureau of Mines records. Data on steel output from the American Iron and Steel Institute.

TABLE 2.—Ferrous scrap and pig iron consumed in the United States and percent of total derived from home scrap, purchased scrap, and pig iron, 1949–50, by districts

District	1949					1950				
	Total used (short tons)	Percent of total used				Total used (short tons)	Percent of total used			
		Scrap			Pig iron		Scrap			Pig iron
		Home	Purchased	Total			Home	Purchased	Total	
New England	1,048,785	32.9	40.1	73.0	27.0	1,327,623	31.5	41.5	73.0	27.0
Middle Atlantic	34,105,774	26.5	21.3	47.8	52.2	42,428,424	25.3	23.5	48.8	51.2
Southeastern	15,188,675	24.8	18.2	43.0	57.0	18,265,875	24.9	18.1	43.0	57.0
Southwestern	889,495	22.1	54.9	77.0	23.0	1,367,470	25.3	48.1	73.4	26.6
North Central	51,049,688	28.2	23.9	52.1	47.9	63,515,273	27.7	26.1	53.8	46.2
Rocky Mountain	2,590,748	26.1	21.2	47.3	52.7	3,309,550	27.3	19.3	46.6	53.4
Pacific Coast	2,911,823	26.0	50.3	76.3	23.7	3,630,178	27.0	46.6	73.6	26.4
Total	107,784,988	27.1	23.3	50.4	49.6	133,844,393	26.6	24.9	51.5	48.5

TABLE 3.—Proportion of home and purchased scrap and pig iron used in furnace charges in the United States, 1949–50, in percent

Type of furnace	1949				1950			
	Scrap			Pig iron	Scrap			Pig iron
	Home	Purchased	Total		Home	Purchased	Total	
Open-hearth	26.7	19.3	46.0	54.0	25.8	20.3	46.1	53.9
Bessemer	3.5	.8	4.3	95.7	3.9	.8	4.7	95.3
Electric	38.5	59.3	97.8	2.2	37.9	60.0	97.9	2.1
Cupola	32.2	32.6	64.8	35.2	31.8	32.1	63.9	36.1
Air [1]	50.3	26.4	76.7	23.3	49.4	28.7	78.1	21.9
Crucible	26.6	26.9	53.5	46.5	30.5	13.3	43.8	56.2
Puddling	14.9	27.0	41.9	58.1	.6	42.3	42.9	57.1
Blast	49.7	50.3	100.0	----------	46.1	53.9	100.0	----------

[1] Includes data for 2 Brackelsberg furnaces.

TABLE 4.—Consumption of ferrous scrap and pig iron in the United States, 1949–50, by type of furnace, in short tons

Type of furnace or equipment	Active plants reporting [1]	Scrap			Pig iron
		Home	Purchased	Total	
1949					
Open-hearth	127	20,653,122	14,869,332	35,522,454	41,782,506
Bessemer	28	171,885	37,281	209,166	4,612,408
Electric	318	1,850,205	2,846,389	4,696,594	107,589
Cupola	2,366	4,348,890	4,408,565	8,757,455	4,764,003
Air	120	591,060	309,665	900,725	273,514
Brackelsberg	2				
Crucible	14	602	609	1,211	1,052
Puddling	1	993	1,801	2,794	3,880
Blast	72	1,494,398	1,512,483	3,006,881	----------
Direct castings	33	----------	----------	----------	1,901,760
Ferro-alloy	18	9,756	285,931	295,687	----------
Miscellaneous	101	45,582	899,674	945,256	53
Total	3,200	29,166,493	25,171,730	54,338,223	53,446,765
1950					
Open-hearth	122	24,309,250	19,202,771	43,512,021	50,946,134
Bessemer	30	211,316	45,374	256,690	5,169,835
Electric	345	2,832,937	4,489,933	7,322,870	153,641
Cupola	2,516	5,335,513	5,385,463	10,720,976	6,059,188
Air	113	756,077	439,188	1,195,265	334,613
Brackelsberg	2				
Crucible	14	646	280	926	1,190
Puddling	1	31	2,346	2,377	3,168
Blast	72	2,024,168	2,365,897	4,390,065	----------
Direct castings	31	----------	----------	----------	2,275,349
Ferro-alloy	17	12,454	343,004	355,458	----------
Miscellaneous	91	42,715	1,101,912	1,144,627	----------
Total	3,354	35,525,107	33,376,168	68,901,275	64,943,118

[1] Where 2 or more separate departments, such as blast furnace, open hearth, foundry, etc., are situated at the same place and are operated by 1 establishment, each department is counted as 1 plant.

TABLE 5.—Consumption of ferrous scrap and pig iron by manufacturers of steel ingots and castings [1] in 1950, by type of furnace, in short tons

Type of furnace or equipment	Scrap			Pig iron
	Home	Purchased	Total	
Open-hearth	24,016,598	18,584,775	42,601,373	50,791,917
Bessemer	201,022	22,006	223,028	5,164,572
Electric	2,235,054	3,743,883	5,978,937	110,344
Cupola	255,533	94,721	350,254	508,055
Air	24,669	17,133	41,802	17,390
Crucible	6	5	11	
Blast [2]	2,023,876	2,362,412	4,386,288	
Direct castings				1,444,093
Miscellaneous	33,522	329,947	363,469	
Total: 1950	28,790,280	25,154,882	53,945,162	58,036,371
1949	23,635,547	18,431,752	42,067,299	47,940,613

[1] Includes only those castings made by companies producing steel ingots.
[2] Includes consumption in blast furnaces by both integrated and nonintegrated mills.

TABLE 6.—Consumption of ferrous scrap and pig iron by manufacturers of steel castings [1] in 1950, by type of furnace, in short tons

Type of furnace or equipment	Scrap			Pig iron
	Home	Purchased	Total	
Open-hearth	292,652	617,654	910,306	153,503
Bessemer	7,683	12,131	19,814	1,982
Electric	524,693	694,122	1,218,815	22,807
Cupola	159,075	407,268	566,343	185,164
Air, Brackelsberg	191,838	137,055	328,893	72,745
Total: 1950	1,175,941	1,868,230	3,044,171	436,201
1949	842,939	1,384,925	2,227,864	349,284

[1] Excludes companies that produce both steel castings and steel ingots.

TABLE 7.—Consumption of ferrous scrap and pig iron by iron foundries and miscellaneous users in 1950, by type of furnace, in short tons

Type of furnace or equipment	Scrap			Pig iron
	Home	Purchased	Total	
Open-hearth		342	342	714
Bessemer	2,611	11,237	13,848	3,281
Electric	73,190	51,928	125,118	20,490
Cupola	4,920,905	4,883,474	9,804,379	5,365,969
Air	539,570	285,000	824,570	244,478
Crucible	640	275	915	1,190
Blast	292	3,485	3,777	
Direct castings				831,256
Puddling	31	2,346	2,377	3,168
Ferro-alloy	12,454	343,004	355,458	
Miscellaneous	9,193	771,965	781,158	
Total: 1950	5,558,886	6,353,056	11,911,942	6,470,546
1949	4,688,007	5,355,053	10,043,060	5,156,868

CONSUMPTION BY DISTRICTS AND STATES

During 1950 iron and steel scrap and pig iron were used in all 48 States and the District of Columbia; none was used in Alaska. As in 1949, the largest consuming districts were North Central, Middle Atlantic, and Southeastern. All districts increased over 1949 in total scrap and pig iron. The States having the largest consumption of scrap, with the percentage consumed, were: Pennsylvania 24, Ohio 18, Illinois 10, and Indiana 9.

TABLE 8.—Consumption of ferrous scrap and pig iron in the United States, 1946–50, by districts

District and year	Active plants reporting [1]	Scrap: Home: Short tons	Scrap: Home: Change from previous year (percent)	Scrap: Purchased: Short tons	Scrap: Purchased: Change from previous year (percent)	Scrap: Total: Short tons	Scrap: Total: Change from previous year (percent)	Pig iron: Short tons	Pig iron: Change from previous year (percent)
New England:									
1946	240	392, 656	+9.4	477, 788	+5.9	870, 444	+7.4	296, 970	−16.2
1947	245	460, 062	+17.2	561, 545	+17.5	1, 021, 607	+17.4	352, 297	+18.6
1948	241	442, 821	−3.7	648, 418	+15.5	1, 091, 239	+6.8	342, 893	−2.7
1949	228	345, 288	−22.0	420, 160	−35.2	765, 448	−29.9	283, 337	−17.4
1950	244	417, 689	+21.0	551, 282	+31.2	968, 971	+26.6	358, 652	+26.6
Middle Atlantic:									
1946	818	8, 319, 887	−20.0	6, 614, 440	−11.0	14, 934, 327	−16.3	15, 615, 006	−17.7
1947 [2]	807	10, 100, 971	+21.4	8, 626, 526	+30.4	18, 727, 497	+25.4	20, 566, 893	+31.7
1948	792	10, 564, 402	+4.6	9, 403, 012	+9.0	19, 967, 414	+6.6	20, 990, 519	+2.1
1949	761	9, 023, 788	−14.6	7, 277, 130	−22.6	16, 300, 918	−18.4	17, 804, 856	−15.2
1950	773	10, 740, 008	+19.0	9, 947, 422	+36.7	20, 687, 430	+26.9	21, 740, 994	+22.1
Southeastern:									
1946	476	3, 144, 778	−9.5	2, 547, 664	−6.7	5, 692, 442	−8.3	6, 612, 070	−11.4
1947 [2]	469	3, 639, 590	+15.7	3, 059, 105	+20.1	6, 698, 695	+17.7	8, 216, 999	+24.3
1948	471	3, 946, 494	+8.4	3, 457, 432	+13.0	7, 403, 926	+10.5	9, 063, 195	+10.3
1949	455	3, 770, 512	−4.5	2, 759, 510	−20.2	6, 530, 022	−11.8	8, 658, 653	−4.5
1950	479	4, 558, 702	+20.9	3, 300, 560	+19.6	7, 859, 262	+20.4	10, 406, 613	+20.2
Southwestern:									
1946	121	139, 038	−32.1	402, 683	+6.4	541, 721	−7.2	59, 758	−67.2
1947	123	214, 063	+54.0	532, 740	+32.3	746, 803	+37.9	125, 857	+110.6
1948	120	233, 904	+9.3	573, 557	+7.7	807, 461	+8.1	237, 972	+89.1
1949	115	196, 586	−16.0	488, 576	−14.8	685, 162	−15.1	204, 333	−14.1
1950	133	345, 371	+75.7	658, 095	+34.7	1, 003, 466	+46.5	364, 004	+78.1
North Central:									
1946	1, 357	13, 053, 967	−14.3	11, 515, 917	−6.8	24, 569, 884	−10.9	21, 169, 706	−14.1
1947 [2]	1, 356	15, 553, 560	+19.1	14, 258, 421	+23.8	29, 811, 981	+21.3	26, 643, 575	+25.9
1948	1, 340	15, 708, 820	+1.0	15, 891, 047	+11.5	31, 599, 867	+6.0	27, 160, 420	+1.9
1949	1, 305	14, 397, 633	−8.3	12, 211, 219	−23.2	26, 608, 852	−15.8	24, 440, 836	−10.0
1950	1, 371	17, 580, 059	+22.1	16, 590, 333	+35.9	34, 170, 392	+28.4	29, 344, 881	+20.1
Rocky Mountain:									
1946	90	496, 260	−19.0	428, 171	−27.7	924, 431	−23.3	764, 037	−28.4
1947	88	764, 317	+54.0	498, 052	+16.3	1, 262, 369	+36.6	1, 515, 960	+98.4
1948	85	753, 167	−1.5	583, 453	+17.1	1, 336, 620	+5.9	1, 585, 327	+4.6
1949	81	676, 327	−10.2	548, 626	−6.0	1, 224, 953	−8.4	1, 365, 795	−13.8
1950	80	903, 368	+33.6	637, 410	+16.2	1, 540, 778	+25.8	1, 768, 772	+29.5
Pacific Coast:									
1946	279	587, 577	−12.4	1, 363, 285	+5.7	1, 950, 862	−.5	554, 083	+8.4
1947 [2]	270	671, 750	+14.3	1, 724, 540	+26.5	2, 396, 290	+22.8	652, 976	+17.8
1948	265	770, 035	+14.6	1, 987, 313	+15.2	2, 757, 348	+15.1	646, 078	−1.1
1949	255	756, 359	−1.8	1, 466, 509	−26.2	2, 222, 868	−19.4	688, 955	+6.6
1950	274	979, 910	+29.6	1, 691, 066	+15.3	2, 670, 976	+20.2	959, 202	+39.2
Undistributed: [2]									
1947	7	174, 629	-------	24, 490	-------	199, 119	-------	216, 198	-------
United States:									
1946	3, 381	26, 134, 163	−15.6	23, 349, 948	−7.5	49, 484, 111	−11.9	45, 071, 630	−15.3
1947	3, 365	31, 578, 942	+20.8	29, 285, 419	+25.4	60, 864, 361	+23.0	58, 290, 755	+29.3
1948	3, 314	32, 419, 643	+2.7	32, 544, 232	+11.1	64, 963, 875	+6.7	60, 026, 404	+3.0
1949	3, 200	29, 166, 493	−10.0	25, 171, 730	−23.7	54, 338, 223	−16.4	53, 446, 765	−11.0
1950	3, 354	35, 525, 107	+21.8	33, 376, 168	+32.6	68, 901, 275	+26.8	64, 943, 118	+21.5

[1] Where 2 or more separate departments, such as blast furnace, open-hearth, foundry, etc., are situated at the same place and are operated by 1 establishment, each department is counted as 1 plant.
[2] In 1947 some scrap and pig iron consumed in Middle Atlantic, Southeastern, North Central, and Pacific Coast districts—not separable—are included with "Undistributed."

TABLE 9.—Consumption of ferrous scrap and pig iron in the United States in 1950, by States and districts

State and district	Active plants reporting[1]	Scrap: Home, Short tons	Scrap: Home, Percent of total	Scrap: Purchased, Short tons	Scrap: Purchased, Percent of total	Scrap: Total, Short tons	Scrap: Total, Percent of total	Pig iron: Short tons	Pig iron: Percent of total
Connecticut	65	126,481	0.4	196,869	0.6	323,350	0.5	75,868	0.1
Maine	19	10,668	.1	5,980	(2)	16,648	(2)	9,657	(2)
Massachusetts	113	227,183	.6	280,096	.9	507,279	.8	218,931	.3
New Hampshire	18	8,089	(2)	11,828	(2)	19,917	(2)	4,190	(2)
Rhode Island	16	37,586	.1	47,113	.1	84,699	.1	41,223	.1
Vermont	13	7,682	(2)	9,396	(2)	17,078	(2)	8,783	(2)
Total New England	244	417,689	1.2	551,282	1.6	968,971	1.4	358,652	.5
Delaware } New Jersey	8 / 96	383,453	1.1	676,970	2.0	1,060,423	1.5	365,985	.6
New York	206	1,597,477	4.5	1,763,635	5.3	3,361,112	4.9	3,060,001	4.7
Pennsylvania	463	8,759,078	24.6	7,506,817	22.5	16,265,895	23.6	18,315,008	28.2
Total Middle Atlantic	773	10,740,008	30.2	9,947,422	29.8	20,687,430	30.0	21,740,994	33.5
Alabama	98	1,633,370	4.6	879,261	2.6	2,512,631	3.7	3,777,495	5.8
District of Columbia } Kentucky } Maryland	2 / 27 / 27	1,984,402	5.6	1,008,824	3.0	2,993,226	4.3	4,347,710	6.7
Florida } Georgia	18 / 58	69,817	.2	157,958	.5	227,775	.3	86,243	.1
Mississippi	9	1,088	(2)	1,283	(2)	2,371	(2)	1,166	(2)
North Carolina	57	23,536	.1	32,193	.1	55,729	.1	30,658	.1
South Carolina	23	9,824	(2)	8,469	(2)	18,293	(2)	11,424	(2)
Tennessee } Virginia	65 / 64	228,816	.6	300,138	.9	528,954	.8	282,580	.4
West Virginia	31	607,849	1.7	912,434	2.8	1,520,283	2.2	1,869,337	2.9
Total Southeastern	479	4,558,702	12.8	3,300,560	9.9	7,859,262	11.4	10,406,613	16.0
Arkansas } Louisiana } Oklahoma	11 / 25 / 21	19,734	.1	92,461	.3	112,195	.2	7,280	(2)
Texas	76	325,637	.9	565,634	1.7	891,271	1.3	356,724	.6
Total Southwestern	133	345,371	1.0	658,095	2.0	1,003,466	1.5	364,004	.6
Illinois	251	3,166,954	8.9	3,646,435	10.9	6,813,389	9.9	5,465,752	8.4
Indiana	159	4,074,114	11.5	2,294,345	6.9	6,368,459	9.2	7,480,127	11.5
Iowa	57	147,344	.4	297,171	.9	444,515	.6	101,702	.2
Kansas } Nebraska	33 / 16	38,076	.1	77,541	.2	115,617	.2	16,887	(2)
Michigan } Wisconsin	205 / 149	3,360,054	9.5	3,168,963	9.5	6,529,017	9.5	3,983,516	6.2
Minnesota	72	299,209	.8	353,589	1.0	652,798	1.0	541,493	.8
Missouri	66	172,795	.5	723,442	2.2	896,237	1.3	86,939	.1
North Dakota } South Dakota	3 / 3	1,635	(2)	910	(2)	2,545	(2)	608	(2)
Ohio	357	6,319,878	17.8	6,027,937	18.1	12,347,815	17.9	11,667,857	18.0
Total North Central	1,371	17,580,059	49.5	16,590,333	49.7	34,170,392	49.6	29,344,881	45.2
Arizona } Nevada } New Mexico	8 / 3 / 1	4,375	(2)	56,567	.2	60,942	.1	1,520	(2)
Colorado } Utah	28 / 23	891,250	2.5	551,838	1.6	1,443,088	2.1	1,766,874	2.7
Idaho	6	1,891	(2)	7,919	(2)	9,810	(2)	167	(2)
Montana	9	5,848	(2)	21,081	.1	26,929	(2)	207	(2)
Wyoming	2	4	(2)	5	(2)	9	(2)	4	(2)
Total Rocky Mountain	80	903,368	2.5	637,410	1.9	1,540,778	2.2	1,768,772	2.7
California	167	889,111	2.5	1,328,563	4.0	2,217,674	3.2	937,740	1.5
Oregon } Washington	46 / 61	90,799	.3	362,503	1.1	453,302	.7	21,462	(2)
Total Pacific Coast	274	979,910	2.8	1,691,066	5.1	2,670,976	3.9	959,202	1.5
Total United States:									
1950	3,354	35,525,107	100.0	33,376,168	100.0	68,901,275	100.0	64,943,118	100.0
1949	[1] 3,200	29,166,493	100.0	25,171,730	100.0	54,338,223	100.0	53,446,765	100.0

[1] Where 2 or more separate departments, such as blast furnace, open hearth, foundry, etc., are situated at the same place and are operated by 1 establishment, each department is counted as 1 plant.
[2] Less than 0.05 percent.

CONSUMPTION BY TYPE OF FURNACE

Open-Hearth Furnaces.—Ferrous scrap and pig-iron consumption in open-hearth furnaces in 1950 totaled 94,458,155 short tons, an increase of 22 percent over 1949 and the largest consumption by this type of furnace in the history of the industry. The use of home scrap increased 18 percent, purchased scrap 29 percent, total scrap 22 percent, and pig iron 22 percent. The open-hearth furnace melt in 1950 consisted of 46 percent scrap and 54 percent pig iron, unchanged from 1949. Of the total scrap consumed, 44 percent was purchased, compared with 42 percent in 1949 and 46 percent in 1948.

Pennsylvania again led in the use of scrap in the open hearth in 1950, followed in order by Ohio, Indiana, and Illinois; this rank has remained unchanged since 1936. In 1935, the first year data were compiled on iron and steel scrap, Ohio consumed the largest quantity, followed by Pennsylvania, Indiana, and Illinois.

TABLE 10.—Consumption of ferrous scrap and pig iron in open-hearth furnaces in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap: Home	Scrap: Purchased	Scrap: Total	Pig iron
New England:					
Connecticut	1				
Massachusetts	2	120, 542	240, 162	360, 704	117, 267
Rhode Island	1				
Total: 1950	4	120, 542	240, 162	360, 704	117, 267
1949	4	103, 716	180, 893	284, 609	94, 085
Middle Atlantic:					
Delaware	1				
New Jersey	2	1, 433, 355	1, 280, 619	2, 713, 974	2, 858, 194
New York	6				
Pennsylvania	43	6, 774, 173	5, 307, 566	12, 081, 739	15, 181, 586
Total: 1950	52	8, 207, 528	6, 588, 185	14, 795, 713	18, 039, 780
1949	55	6, 993, 692	5, 001, 671	11, 995, 363	14, 680, 598
Southeastern and Southwestern:					
Alabama	3				
Georgia	1	1, 259, 367	837, 176	2, 096, 543	3, 194, 623
Texas	1				
Kentucky	2				
Maryland	1	2, 049, 709	1, 454, 522	3, 504, 231	5, 182, 520
Oklahoma	1				
West Virginia	2				
Total: 1950	11	3, 309, 076	2, 291, 698	5, 600, 774	8, 377, 143
1949	11	2, 860, 659	1, 950, 573	4, 811, 232	6, 958, 182
North Central:					
Illinois	10	1, 886, 914	1, 861, 521	3, 748, 435	3, 863, 803
Indiana	6	3, 558, 887	1, 838, 214	5, 397, 101	6, 816, 412
Michigan	3	879, 981	702, 375	1, 582, 356	2, 314, 998
Minnesota	1				
Missouri	2	326, 768	761, 121	1, 087, 889	536, 023
Wisconsin	2				
Ohio	21	4, 507, 363	3, 505, 304	8, 012, 667	8, 473, 452
Total: 1950	45	11, 159, 913	8, 668, 535	19, 828, 448	22, 004, 688
1949	47	9, 560, 981	6, 454, 112	16, 015, 093	18, 201, 488
Rocky Mountain and Pacific Coast:					
California	7				
Colorado	1	1, 512, 191	1, 414, 191	2, 926, 382	2, 407, 256
Utah	1				
Washington	1				
Total: 1950	10	1, 512, 191	1, 414, 191	2, 926, 382	2, 407, 256
1949	10	1, 134, 074	1, 282, 083	2, 416, 157	1, 848, 243
Total United States: 1950	122	24, 309, 250	19, 202, 771	43, 512, 021	50, 946, 134
1949	127	20, 653, 122	14, 869, 332	35, 522, 454	41, 782, 506

Bessemer Converters.—The 5,426,525 short tons of ferrous raw materials used in Bessemer converters in 1950 represents a 13-percent increase over the 1949 use of these materials. The ratio of scrap to total metal charge was 1:21 compared with 1:23 during 1949; of the scrap used, 82 percent was home scrap, the same as the previous year.

Following the usual pattern, Pennsylvania was the principal consumer of converter scrap in 1950.

TABLE 11.—Consumption of ferrous scrap and pig iron in Bessemer converters in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap			Pig iron
		Home	Purchased	Total	
New England and Middle Atlantic:					
Connecticut	1				
Delaware	2	2,804	3,782	6,586	1,142
New Jersey	1				
Pennsylvania	9	82,678	15,494	98,172	1,521,692
Total: 1950	13	85,482	19,276	104,758	1,522,834
1949	12	87,871	21,660	109,531	1,374,900
Southeastern and Southwestern:					
Alabama	1				
Louisiana	1				
Maryland	1	34,362	11,949	46,311	733,101
Texas	1				
West Virginia	1				
Total: 1950	5	34,362	11,949	46,311	733,101
1949	5	22,879	9,494	32,373	631,002
North Central and Pacific Coast:					
Illinois	2	1,312	2,268	3,580	420,428
Indiana	1				
Michigan	1				
Minnesota	1	5,541	11,881	17,422	300,156
Missouri	1				
Colorado	1				
Washington	1				
Ohio	4	84,619		84,619	2,193,316
Total: 1950	12	91,472	14,149	105,621	2,913,900
1949	11	61,135	6,127	67,262	2,606,506
Total United States: 1950	30	211,316	45,374	256,690	5,169,835
1949	28	171,885	37,281	209,166	4,612,408

Electric Steel Furnaces.—The melt of ferrous scrap and pig iron used in electric furnaces in 1950 totaled 7,476,511 short tons, a 56-percent increase over the 4,804,183 tons used in 1949. Of the total scrap used, 4,489,933 short tons was purchased scrap, which established a record high for the use of this material in these furnaces. Increases in the use of scrap occurred in all except the Southwestern district; pig iron increased in all districts.

TABLE 12.—Consumption of ferrous scrap and pig iron in electric steel furnaces in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap			Pig iron
		Home	Purchased	Total	
New England:					
Connecticut	4				
New Hampshire	1	7,342	7,435	14,777	451
Massachusetts	9	7,982	6,521	14,503	198
Total: 1950	14	15,324	13,956	29,280	649
1949	13	14,972	11,693	26,665	413
Middle Atlantic:					
Delaware	1				
New Jersey	9	13,773	18,894	32,667	352
New York	18	65,629	87,614	153,243	4,363
Pennsylvania	63	721,962	897,940	1,619,902	18,672
Total: 1950	91	801,364	1,004,448	1,805,812	23,387
1949	85	574,971	642,670	1,217,641	17,910
Southeastern:					
District of Columbia	1				
Kentucky	2				
Maryland	5	61,875	231,834	293,709	3,614
West Virginia	1				
Alabama	6				
Florida	1	14,715	41,395	56,110	349
Georgia	2				
North Carolina	1				
South Carolina	1				
Tennessee	3	13,373	16,070	29,443	981
Virginia	4				
Total: 1950	27	89,963	289,299	379,262	4,944
1949	27	41,986	133,991	175,977	4,315
Southwestern:					
Arkansas	1				
Louisiana	3				
Oklahoma	1	16,894	32,630	49,524	1,380
Texas	7				
Total: 1950	12	16,894	32,630	49,524	1,380
1949	14	27,938	25,110	53,048	1,309
North Central:					
Illinois	28	512,908	714,163	1,227,071	85,591
Indiana	15	42,770	44,084	86,854	753
Iowa	1				
Kansas	1	15,908	24,023	39,931	144
Nebraska	1				
Michigan	27	393,274	743,085	1,136,359	5,399
Minnesota	3	4,618	7,193	11,811	154
Missouri	10	13,744	15,997	29,741	1,876
Ohio	35	687,045	1,124,295	1,811,340	22,212
Wisconsin	17	66,728	74,213	140,941	2,716
Total: 1950	138	1,736,995	2,747,053	4,484,048	118,845
1949	120	1,067,077	1,765,877	2,832,954	81,153
Rocky Mountain:					
Arizona	1				
Colorado	3	7,558	11,075	18,633	540
Nevada	1				
Utah	1				
Total: 1950	6	7,558	11,075	18,633	540
1949	6	5,133	8,199	13,332	285
Pacific Coast:					
California	31	129,214	244,864	374,078	3,466
Oregon	8	20,358	93,707	114,065	181
Washington	18	15,267	52,901	68,168	249
Total: 1950	57	164,839	391,472	556,311	3,896
1949	53	118,128	258,849	376,977	2,204
Total United States: 1950	345	2,832,937	4,489,933	7,322,870	153,641
1949	318	1,850,205	2,846,389	4,696,594	107,589

Cupolas.—Figures released by the Bureau of the Census, United States Department of Commerce, indicate that shipments of gray-iron castings in 1950 increased 24 percent over 1949. Accordingly, requirements for scrap and pig-iron cupola consumption increased in 1950. Cupola furnaces used 16,780,164 short tons of scrap and pig iron, a 24-percent increase over the 13,521,458 tons used in 1949 and a record high for the consumption of these materials in this type of furnace. The use of home scrap increased 23 percent, purchased scrap 22 percent, total scrap 22 percent, and pig iron 27 percent.

Charges to cupolas consisted of 32 percent home scrap, 32 percent purchased scrap, and 36 percent pig iron compared with 32, 33, and 35 percent, respectively, in 1949.

As in 1949, Michigan continued to be the largest consumer of cupola scrap, followed in order by Ohio, Illinois, Pennsylvania, Alabama, Wisconsin, Indiana, New York, and New Jersey.

TABLE 13.—Consumption of ferrous scrap and pig iron in cupola furnaces in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap: Home	Scrap: Purchased	Scrap: Total	Pig iron
New England:					
Connecticut	50	63, 557	101, 909	165, 466	64, 245
Maine	19	10, 668	5, 980	16, 648	9, 657
Massachusetts	96	127, 754	112, 990	240, 744	116, 719
New Hampshire	16	3, 086	10, 546	13, 632	2, 434
Rhode Island	14	18, 814	17, 192	36, 006	18, 704
Vermont	13	7, 682	9, 396	17, 078	8, 783
Total: 1950	208	231, 561	258, 013	489, 574	220, 542
1949	193	191, 474	193, 693	385, 167	175, 234
Middle Atlantic:					
Delaware	3	1, 202	3, 208	4, 410	1, 632
New Jersey	74	161, 154	272, 233	433, 387	231, 705
New York	152	218, 071	228, 347	446, 418	244, 812
Pennsylvania	279	357, 860	425, 328	783, 188	491, 985
Total: 1950	508	738, 287	929, 116	1, 667, 403	970, 134
1949	493	653, 335	741, 632	1, 394, 967	806, 252
Southeastern:					
Alabama	80	375, 397	329, 333	704, 730	927, 653
Maryland	19	36, 091	37, 731	73, 822	63, 078
Florida	17	2, 114	4, 574	6, 688	1, 283
Georgia	53	18, 968	18, 635	37, 603	30, 868
Kentucky	21	80, 519	31, 193	111, 712	181, 175
Mississippi	9	1, 088	1, 283	2, 371	1, 166
North Carolina	56	22, 245	32, 110	54, 355	30, 541
South Carolina	21	9, 822	8, 115	17, 937	11, 422
Tennessee	59	149, 173	136, 187	285, 360	198, 760
Virginia	58	66, 635	122, 503	189, 138	82, 958
West Virginia	19	7, 836	15, 859	23, 695	6, 975
Total: 1950	412	769, 888	737, 523	1, 507, 411	1, 535, 879
1949	386	566, 682	620, 542	1, 187, 224	1, 201, 737
Southwestern:					
Arkansas	10	704	3, 143	3, 847	597
Louisiana	20	2, 277	4, 614	6, 891	1, 000
Oklahoma	18	6, 238	13, 188	19, 426	4, 952
Texas	62	45, 125	97, 097	142, 222	61, 770
Total: 1950	110	54, 344	118, 042	172, 386	68, 319
1949	89	37, 688	93, 252	130, 940	33, 371
North Central:					
Illinois	178	554, 691	434, 498	989, 189	411, 713
Indiana	119	298, 133	271, 088	569, 221	318, 524
Iowa	54	127, 839	132, 461	260, 300	98, 708
Kansas	32	19, 810	49, 053	68, 863	12, 759
Michigan	165	1, 388, 741	1, 028, 726	2, 417, 467	1, 344, 564
Minnesota	62	60, 265	94, 641	154, 906	47, 548
Missouri	47	64, 022	116, 272	180, 294	42, 759
Nebraska	14	6, 492	8, 908	15, 400	3, 985

TABLE 13.—Consumption of ferrous scrap and pig iron in cupola furnaces in the United States in 1950, by districts and States, in short tons—Continued

District and State	Active plants reporting	Scrap			Pig iron
		Home	Purchased	Total	
North Central—Continued					
North Dakota	3	1,635	910	2,545	608
South Dakota	3				
Ohio	241	515,702	572,381	1,088,083	530,740
Wisconsin	116	326,892	258,421	585,313	260,211
Total: 1950	1,034	3,364,222	2,967,359	6,331,581	3,072,119
1949	977	2,738,037	2,425,206	5,163,243	2,432,258
Rocky Mountain:					
Arizona	5	1,064	33,222	34,286	1,289
Colorado	20	18,297	41,061	59,358	34,599
Idaho	5	1,432	3,099	4,531	167
Montana	6	5,425	4,881	10,306	207
New Mexico	1	377	743	1,120	59
Utah	14	23,708	44,524	68,232	56,965
Wyoming	2	4	5	9	4
Total: 1950	53	50,307	127,535	177,842	93,290
1949	52	70,543	117,158	187,701	61,395
Pacific Coast:					
California	117	107,233	186,015	293,248	87,410
Oregon	37	9,675	26,754	36,429	7,217
Washington	37	9,996	35,106	45,102	4,278
Total: 1950	191	126,904	247,875	374,779	98,905
1949	176	91,131	217,082	308,213	53,756
Total United States: 1950	2,516	5,335,513	5,385,463	10,720,976	6,059,188
1949	2,366	4,348,890	4,408,565	8,757,455	4,764,003

Air Furnaces.—Scrap and pig iron consumed in air furnaces (including two Brackelsbergs) in 1950 amounted to 1,529,878 short tons, an increase of 30 percent over the 1,174,239 tons melted in these furnaces in 1949. The use of home scrap increased 28 percent and of purchased scrap 42 percent; pig iron increased 22 percent.

Ohio led in the use of scrap in air furnaces, followed in order by Illinois–Indiana (combined), Pennsylvania, Wisconsin, Michigan, and New York.

TABLE 14.—Consumption of ferrous scrap and pig iron in air furnaces[1] in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap			Pig iron
		Home	Purchased	Total	
New England:					
Connecticut	7	42,701	14,304	57,005	19,594
Massachusetts	3				
New Hampshire	1				
Rhode Island	1				
Total: 1950	12	42,701	14,304	57,005	19,594
1949	12	27,728	7,734	35,462	13,060
Middle Atlantic:					
Delaware	1	10,357	2,085	12,442	6,429
New Jersey	2				
New York	9	36,431	17,748	54,179	16,395
Pennsylvania	19	91,728	60,163	151,891	54,499
Total: 1950	31	138,516	79,996	218,512	77,323
1949	34	102,144	59,332	161,476	65,827

For footnote, see end of table.

TABLE 14.—Consumption of ferrous scrap and pig iron in air furnaces [1] in the United States in 1950, by districts and States, in short tons—Continued

District and State	Active plants reporting	Scrap: Home	Scrap: Purchased	Scrap: Total	Pig iron
Southeastern and Southwestern:					
Texas	1	16,427	10,992	27,419	8,094
West Virginia	2				
Total: 1950	3	16,427	10,992	27,419	8,094
1949	3	11,325	6,830	18,155	5,801
North Central:					
Illinois	14	224,878	122,642	347,520	99,152
Indiana	10				
Michigan	5	53,909	41,344	95,253	20,767
Iowa	1	10,156	3,336	13,492	8,606
Minnesota	1				
Missouri	1				
Ohio	22	203,385	122,530	325,915	71,207
Wisconsin	11	63,407	42,486	105,893	27,290
Total: 1950	65	555,735	332,338	888,073	227,022
1949	68	446,645	234,964	681,609	185,591
Rocky Mountain and Pacific Coast:					
California	3	2,698	1,558	4,256	2,580
Colorado	1				
Total: 1950	4	2,698	1,558	4,256	2,580
1949	5	3,218	805	4,023	3,235
Total United States: 1950	115	756,077	439,188	1,195,265	334,613
1949	122	591,060	309,665	900,725	273,514

[1] Includes 2 Brackelsberg furnaces, 1 each in Indiana and Ohio.

Crucible and Puddling Furnaces.—Crucible furnaces used 926 short tons of scrap and 1,190 tons of pig iron in 1950 compared with 1,211 and 1,052 tons, respectively, in 1949. Puddling furnaces used 5,545 tons of scrap and pig iron. Of the total puddling-furnace melt in 1950, 2,377 tons were scrap compared with 2,794 tons during the previous year. All of the scrap and pig iron consumed in puddling furnaces was in Pennsylvania.

TABLE 15.—Consumption of ferrous scrap and pig iron in crucible and puddling furnaces in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap: Home	Scrap: Purchased	Scrap: Total	Pig iron
New England:					
Connecticut	1	213	23	236	373
Massachusetts	1				
Total: 1950	2	213	23	236	373
1949	2	305	436	741	411
Middle Atlantic and Southeastern:					
District of Columbia	1	290	157	447	450
New York	1				
Pennsylvania	4	60	2,366	2,426	3,176
Total: 1950	6	350	2,523	2,873	3,626
1949	8	1,237	1,928	3,165	4,295
North Central:					
Indiana	1	(1)	(1)	(1)	(1)
Michigan	1				
Ohio	2				
Wisconsin	1				
Total: 1950	5	(1)	(1)	(1)	(1)
1949	3				

For footnote, see end of table.

TABLE 15.—Consumption of ferrous scrap and pig iron in crucible and puddling furnaces in the United States in 1950, by districts and States, in short tons—Con.

District and State	Active plants reporting	Scrap			Pig iron
		Home	Purchased	Total	
Southwestern and Pacific Coast:					
California	1	(1)	(1)	(1)	(1)
Oklahoma	1				
Total: 1950	2	(1)	(1)	(1)	(1)
1949	2				
Total United States: 1950	15	677	2,626	3,303	4,358
1949	15	1,595	2,410	4,005	4,932

[1] Figure withheld to avoid disclosure of individual operations.

Blast Furnaces.—Materials other than scrap constitute by far the largest proportion of the blast-furnace charge and in 1950 consisted of 117,002,059 short tons of iron ore, sinter, and manganiferous ore; 3,533,600 tons of mill cinder and roll scale; 3,600,267 tons of open-hearth and Bessemer slag; and 47,322 tons of miscellaneous materials.

Total consumption of scrap in 1950 by 72 plants operating blast furnaces was 4,390,065 short tons, a 46-percent increase over 1949. The scrap charged to blast furnaces was 46 percent home, 54 percent purchased, compared with 50 percent each for home and purchased in 1949, and 49 and 51 percent, respectively, in 1948. The proportion of scrap used to pig iron produced was 6.8 percent (home scrap 3.1 percent and purchased 3.7 percent) compared with 5.6 percent in 1949.

TABLE 16.—Consumption of ferrous scrap in blast furnaces in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap		
		Home	Purchased	Total
New England and Middle Atlantic:				
Massachusetts	1	41,832	249,939	291,771
New York	6			
Pennsylvania	17	711,964	670,281	1,382,245
Total: 1950	24	753,796	920,220	1,674,016
1949	24	593,179	492,609	1,085,788
Southeastern and Southwestern:				
Alabama	4	241,169	144,255	385,424
Kentucky	1			
Maryland	1			
Tennessee	1	370,004	133,470	503,474
Texas	2			
West Virginia	2			
Total: 1950	11	611,173	277,725	888,898
1949	12	394,221	209,470	603,691
North Central:				
Illinois	6	89,349	239,746	329,095
Indiana	3	54,797	81,258	136,055
Michigan	2	177,385	242,329	419,714
Minnesota	2			
Ohio	20	321,695	600,664	922,359
Total: 1950	33	643,226	1,163,997	1,807,223
1949	34	498,418	810,108	1,308,526
Rocky Mountain:				
California	1			
Colorado	1	15,973	3,955	19,928
Utah	2			
Total: 1950	4	15,973	3,955	19,928
1949	2	8,580	296	8,876
Total United States: 1950	72	2,024,168	2,365,897	4,390,065
1949	72	1,494,398	1,512,483	3,006,881

USE OF SCRAP IN FERRO-ALLOY PRODUCTION

The producers of ferro-alloys (by other than blast furnaces) in 1950 consumed 355,458 short tons of scrap, a 20-percent increase over 1949. Of this total, 253 tons were used in the aluminothermic process and the balance in electric furnaces. Purchased scrap accounted for 96 percent of the quantity used and home scrap 4 percent; in 1949 the percentages were 97 and 3, respectively.

Seventeen ferro-alloy plants used ferrous scrap in 1950, 1 less than in 1949. All of these plants operated electric furnaces. Two of this group employed both the electric and aluminothermic process.

Scrap used in blast furnaces in the manufacture of ferro-alloys is included in this chapter with blast furnaces.

TABLE 17.—Consumption of ferrous scrap by ferro-alloy producers in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap		
		Home	Purchased	Total
Middle Atlantic:				
New York	5	20	80,032	80,052
Pennsylvania	2		954	954
Total: 1950	7	20	80,986	81,006
1949	7	117	58,653	58,770
North Central:				
Iowa	1	12,434	182,208	194,642
Ohio	2			
Total: 1950	3	12,434	182,208	194,642
1949	4	9,639	132,644	142,283
Southeastern:				
Alabama	1		72,947	72,947
Kentucky	1			
South Carolina	1			
Tennessee	1			
West Virginia	1			
Total: 1950	5		72,947	72,947
1949	5		84,707	84,707
Pacific Coast:				
Oregon	1		6,863	6,863
Washington	1			
Total: 1950	2		6,863	6,863
1949	2		9,927	9,927
Total United States: 1950	17	12,454	343,004	355,458
1949	18	9,756	285,931	295,687

MISCELLANEOUS USES

Scrap consumed in 1950 for miscellaneous purposes, such as rerolling, nonferrous metallurgy, and as a chemical agent, remained at slightly less than 2 percent of the total consumption. This percentage has been unchanged for the past 6 years. The quantity so used—1,144,627 short tons—was an increase of 21 percent over that used for these purposes in 1949. Of the quantity used, 96 percent was purchased and 4 percent home scrap.

TABLE 18.—Consumption of ferrous scrap in miscellaneous uses in the United States in 1950, by districts and States, in short tons

District and State	Active plants reporting	Scrap: Home	Scrap: Purchased	Scrap: Total
New England:				
Connecticut	1	681	14,799	15,480
Massachusetts	1			
Total: 1950	2	681	14,799	15,480
1949	2	665	12,271	12,936
Middle Atlantic:				
New Jersey	8	2,688	111,612	114,300
New York	7	278	94,360	94,638
Pennsylvania	16	18,653	126,725	145,378
Total: 1950	31	21,619	332,697	354,316
1949	33	23,869	270,415	294,284
Southeastern:				
Alabama	3	100	39,432	39,532
Georgia	2	753	1,129	1,882
Tennessee	1			
Virginia	2	499	65,830	66,329
West Virginia	1			
Total: 1950	9	1,352	106,391	107,743
1949	10	1,929	106,570	108,499
Southwestern:				
Louisiana	1	307	9,459	9,766
Texas	2			
Total: 1950	3	307	9,459	9,766
1949	3	1,592	7,547	9,139
North Central:				
Illinois	9	1,226	319,873	321,099
Indiana	3	13,031	8,796	21,827
Michigan	1			
Nebraska	1	1,757	27,746	29,503
Wisconsin	2			
Minnesota	1	-	560	560
Missouri	5	-	78,192	78,192
Ohio	3	10	79,708	79,718
Total: 1950	25	16,024	514,875	530,899
1949	28	15,762	382,194	397,956
Rocky Mountain:				
Arizona	2	-	21,508	21,508
Nevada	2			
Colorado	1			
Idaho	1	1,048	24,504	25,552
Montana	3			
Utah	3	1,214	18,833	20,047
Total: 1950	12	2,262	64,845	67,107
1949	16	1,413	65,681	67,094
Pacific Coast:				
California	6	441	57,505	57,946
Washington	3	29	1,341	1,370
Total: 1950	9	470	58,846	59,316
1949	9	352	54,996	55,348
Total United States: 1950	91	42,715	1,101,912	1,144,627
1949	101	45,582	899,674	945,256

STOCKS

Complete iron- and steel-scrap stock figures covering 1950 year-end stocks are not available; producers (railroads and manufacturers) were not canvassed. Dealers, automobile wreckers, shipbreakers, and consumers reporting to the Bureau of Mines had 5,718,828 short tons of material on hand December 31, 1950, compared with 6,063,132 short tons at the end of 1949, a decrease of 344,304 tons or 6 percent.

Consumers' Stocks.—Consumers' stocks of home and purchased iron and steel scrap on December 31, 1950, totaled 5,420,326 short tons—a decrease of 220,533 short tons or 4 percent from the beginning of the year. Stocks of home scrap (1,469,463 tons) decreased 6 percent and purchased scrap (3,950,863 tons) 3 percent. Stocks of pig iron on December 31, 1950, amounted to 1,800,137 short tons, an increase of 9 percent over the 1,657,634 short tons on hand December 31, 1949.

TABLE 19.—Consumers' stocks of ferrous scrap and pig iron on hand in the United States on Dec. 31, 1949, and Dec. 31, 1950, by States and districts, in short tons

State and district	Dec. 31, 1949				Dec. 31, 1950			
	Scrap			Pig iron	Scrap			Pig iron
	Home	Purchased	Total		Home	Purchased	Total	
Connecticut	7,673	21,598	29,271	10,904	4,604	19,634	24,238	16,239
Maine	2,493	3,979	6,472	2,596	322	2,067	2,389	4,172
Massachusetts	30,591	56,028	86,619	113,657	33,392	36,378	69,770	59,227
New Hampshire	219	2,741	2,960	681	321	3,322	3,643	756
Rhode Island	1,198	3,704	4,902	6,231	984	5,655	6,639	5,898
Vermont	135	3,668	3,803	771	159	6,745	6,904	2,135
Total New England	42,309	91,718	134,027	134,840	39,782	73,801	113,583	88,427
Delaware, New Jersey	14,061	73,298	87,359	54,091	12,484	84,461	96,945	60,126
New York	52,158	226,691	278,849	173,310	65,872	237,954	303,826	108,388
Pennsylvania	459,012	845,455	1,304,467	318,544	441,541	781,091	1,222,632	291,276
Total Middle Atlantic	525,231	1,145,444	1,670,675	545,945	519,897	1,103,506	1,623,403	459,790
Alabama	66,554	100,837	167,391	105,043	92,268	119,694	211,962	170,836
District of Columbia, Kentucky, Maryland	62,725	77,119	139,844	33,379	53,379	96,749	150,128	38,467
Florida, Georgia	1,280	15,657	16,937	3,475	925	10,491	11,416	4,768
Mississippi	231	603	834	358	73	573	646	424
North Carolina	372	2,085	2,457	2,288	536	1,913	2,449	2,903
South Carolina	70	3,240	3,310	2,211	135	5,351	5,486	2,536
Tennessee, Virginia	12,536	37,423	49,959	43,905	5,240	40,724	45,964	28,816
West Virginia	13,330	102,213	115,543	9,468	5,969	84,276	90,245	6,680
Total Southeastern	157,098	339,177	496,275	200,127	158,525	359,771	518,296	255,430
Arkansas, Louisiana, Oklahoma	543	18,414	18,957	805	481	14,067	14,548	1,106
Texas	9,164	79,189	88,353	45,668	48,326	61,448	109,774	60,463
Total Southwestern	9,707	97,603	107,310	46,473	48,807	75,515	124,322	61,569
Illinois	134,985	599,563	734,548	104,039	98,243	490,972	589,215	129,256
Indiana	193,033	224,060	417,093	61,096	186,030	257,151	443,181	81,349
Iowa	8,258	37,340	45,598	18,872	2,309	49,296	51,605	22,749
Kansas, Nebraska	488	10,491	10,979	2,234	773	15,877	16,650	3,817
Michigan, Wisconsin	100,668	245,649	346,317	176,642	78,770	289,928	368,698	361,048
Minnesota	12,049	85,132	97,181	23,451	12,255	107,523	119,778	13,801
Missouri	1,849	101,779	103,628	13,115	3,222	115,282	118,504	17,003
North Dakota, South Dakota	90	90	180	87	227	130	357	190
Ohio	277,552	620,186	897,738	203,833	228,224	644,357	872,581	222,436
Total North Central	728,972	1,924,290	2,653,262	603,369	610,053	1,970,516	2,580,569	851,649

TABLE 19.—Consumers' stocks of ferrous scrap and pig iron on hand in the United States on Dec. 31, 1949, and Dec. 31, 1950, by States and districts, in short tons—Continued

State and district	Dec. 31, 1949				Dec. 31, 1950			
	Scrap			Pig iron	Scrap			Pig iron
	Home	Purchased	Total		Home	Purchased	Total	
Arizona, Nevada, New Mexico	3,096	6,440	9,536	443	2,697	5,107	7,804	99
Colorado, Utah	63,903	68,680	132,583	28,884	54,583	63,769	118,352	27,540
Idaho		2,779	2,779	56	251	3,328	3,579	140
Montana	1,477	6,088	7,565	198	851	4,418	5,269	165
Wyoming	5		5	4		1	1	9
Total Rocky Mountain	68,481	83,987	152,468	29,585	58,382	76,623	135,005	27,953
Alaska, Oregon, Washington	4,257	87,071	91,328	2,949	2,953	78,008	80,961	6,797
California	27,999	307,515	335,514	94,346	31,064	213,123	244,187	48,522
Total Pacific Coast	32,256	394,586	426,842	97,295	34,017	291,131	325,148	55,319
Total United States	1,564,054	4,076,805	5,640,859	1,657,634	1,469,463	3,950,863	5,420,326	1,800,137

Suppliers' Stocks.—Stocks of iron and steel scrap in the hands of dealers (153,519 tons) and automobile wreckers (4,880 tons) totaled 158,399 short tons on December 31, 1950, compared with 324,387 tons on December 31, 1949—a decrease of 51 percent. Stocks held by shipbreakers amounted to 140,103 short tons on December 31, 1950.

PRICES

The composite price of iron and steel scrap was $26.58 per gross ton in January 1950—a drop of $14.78 per gross ton from $41.36 per gross ton in January 1949—but increased to a record high of $44.02 per gross ton in December, exceeding the previous high of $43.16 in August, September, and October 1948. No. 1 Cast scrap at Chicago was selling at $38.50 per gross ton in January 1950, a decrease of $18.75 per gross ton from January 1949 and $35.80 less than the peak price of $74.30 per gross ton established in August 1948. By December 1950 No. 1 Cast at Chicago had increased to a high for the year of $64.50 per gross ton. No. 1 Heavy-Melting steel at Pittsburgh and Chicago was quoted by Iron Age at $29.95 and $26.70, respectively, in January, which was the low for the year, but increased to a high of $45.57 and $43.44 per gross ton in December at Pittsburgh and Chicago, respectively.

FOREIGN TRADE [1]

Imports.—Imports of iron and steel scrap, including tin-plate scrap, totaled 777,886 short tons in 1950, a decrease of 32 percent from the 1,151,294 (revised) short tons imported in 1949, with the value amounting to $18,480,327 compared with $29,937,798 (revised) in 1949, a decrease of 38 percent. Of the 1950 imports, 185,839 tons came from Germany, 155,181 from France, 113,436 from Japan, 87,981 from Canada, and the remainder from other countries. There were 47,481 tons of tin plate scrap imported in 1950, mostly from Canada, compared with 45,951 in 1949.

Exports.—Exports of ferrous scrap from the United States in 1950 were 217,409 short tons valued at $6,023,737, a 27-percent decrease in tonnage from 1949 and an 18-percent decrease in value. Imports exceeded exports by 560,477 short tons. The tonnage exported amounted to 7 percent of the 5-year prewar average (1935–39) of 3,298,326 tons a year, compared with 9 percent during 1949. The 1950 exports included 8,634 tons of tin-plate circles, strips, cobbles, and terneplate clippings and scrap, valued at $761,490. The same materials in 1949 amounted to 3,634 tons valued at $395,370.

TABLE 20.—Ferrous scrap imported for consumption in the United States, by countries, 1946–50, in short tons

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
Algeria			481	548	15,401
Australia	12	3,451	18,168	12,469	16,635
Belgium-Luxembourg			7,614	5,731	39,092
Canada	36,422	32,864	34,547	71,199	87,981
Canal Zone		1,335	6,957	1,824	1,163
Cuba	4,049	22,687	33,026	10,337	21,242
Denmark			5,808	146	5,006
France			1,113	213	155,181
French Morocco			3,384	1,682	6,586
Germany			227,805	532,850	185,839
Hong Kong					8,915
India			3,694	1,186	325
Iraq					7,466
Italy	1,000	(1)	3,963	16	
Japan			65,856	[2] 209,519	113,436
Netherlands	1		9,863	200,486	70,001
Netherlands Antilles	5,573	5,468	5,411	2,128	3,609
Philippines		3	25,399	75,955	14,253
Union of South Africa		351	4,284	4,461	5,893
United Kingdom	197	1,238	1,251	3,257	8,529
Other countries	10,447	3,284	22,100	17,287	11,333
Total: Short tons	57,701	70,681	480,724	[2] 1,151,294	777,886
Value	$492,506	$1,124,686	$12,180,222	[2] $29,937,798	$18,480,327

[1] Less than 0.5 ton.
[2] Revised figure.

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 21.—Ferrous scrap exported from the United States, 1946–50, by countries of destination, in short tons

[U. S. Department of Commerce]

Destination	1946	1947	1948	1949	1950
Argentina	1,731	1,681	1,187	3,866	1,112
Brazil	737	392	602	12	3,225
British Malaya					863
Canada	82,134	119,223	168,119	[1] 162,631	81,420
Chile	1,268	5,401	48		
China	[2] 6,015	3,645	434	33	255
Colombia	22	206	4		217
Egypt				315	
Hong Kong	393	1,941	1,131	1,558	2,547
India		72	850	808	160
Japan					1,605
Mexico	47,927	33,882	39,291	[1] 123,624	124,537
Netherlands	86	266			355
Norway			34	4,120	
Sweden	16	608	95		
Turkey		120		503	95
Union of South Africa	393	477	58	25	236
United Kingdom	435	141		38	
Uruguay	149	203			
Other countries	291	2,069	341	[1] 1,061	782
Total: Short tons	[2] 141,597	170,327	212,194	[1] 298,594	217,409
Value	$2,734,826	$5,072,847	$7,156,105	[1] $7,342,886	$6,023,737

[1] Includes rerolling rails as follows: Canada 37 tons; Mexico 1,095 tons; other countries 74 tons; total 1,206 tons ($50,086).
[2] Revised figure.

TABLE 22.—Ferrous scrap imported into and exported from the United States, 1946–50, by classes

[U. S. Department of Commerce]

Year	Imports			Exports				
	Iron and steel scrap	Tin-plate scrap	Total	Iron and steel scrap	Tin-plate scrap	Tin-plate circles, strips, cobbles, etc.	Terne-plate clippings and scrap	Total
				SHORT TONS				
1946	30,228	27,473	57,701	[1] 136,264	158	4,514	661	[1] 141,597
1947	36,189	34,492	70,681	164,276	60	5,981	10	170,327
1948	434,710	46,014	480,724	208,246		3,637	311	212,194
1949	[1] 1,105,343	45,951	[1] 1,151,294	[2] 294,960		3,380	254	[2] 298,594
1950	730,405	47,481	777,886	208,775	629	7,844	161	217,409
				VALUE				
1946	$266,733	$225,773	$492,506	[1] $2,330,529	$2,421	$359,346	$42,530	[1] $2,734,826
1947	668,590	456,096	1,124,686	4,280,158	54,396	737,493	800	5,072,847
1948	11,149,265	1,030,957	12,180,222	6,738,977		391,421	25,707	7,156,105
1949	[1] 28,890,519	1,047,279	[1] 29,937,798	6,947,516		370,568	24,802	[2] 7,342,886
1950	17,595,975	884,352	18,480,327	5,262,247	39,237	700,273	21,980	6,023,737

[1] Revised figure.
[2] Includes 1,206 tons rerolling rails valued at $50,086, not separately classified before 1949.

Lead[1]

By Richard H. Mote and Edith E. den Hartog

GENERAL SUMMARY

AT THE beginning of 1950, lead producers, having witnessed in 1949 one of the most precipitous market price declines in the history of the industry, were gravely concerned over the lack of consumer demand and the possibility of rapidly accumulating surpluses. This anxiety was further increased several months later by rumors within the trade that Government purchases of lead for the National Strategic Stockpile were to be discontinued in July. There was little evidence that smelter and refinery stocks of lead and material in process would decline from the abnormally high levels prevailing during the first quarter of the year. On January 1, 1950, stocks were higher than at any similar date since January 1, 1939. The lack of confidence in price stability was further evidenced during the first months of 1950 by consumers' cautious buying, which caused a further depression in the market quotation from 12 cents per pound on January 1 to 10½ cents on March 14.

With the outbreak of the war in Korea in late June and the acceleration of the National Defense Program that followed immediately thereafter, industrial activity increased. Consumers recalling the difficulties experienced in obtaining full requirements of lead in World War II promptly abandoned the prudent buying practices used early in 1950. Demand increased rapidly, and lead shipments from primary refineries, which had dropped as low as 21,855 tons in February, advanced to 47,031 tons in August and to over 62,000 tons in October. Lead prices strengthened throughout the summer and early fall, reaching 17 cents per pound at the end of October.

The net effect of the abrupt mid-year change was record-breaking in several instances. Total domestic lead consumption increased 29 percent over 1949 and was the largest quantity ever recorded. Mine output increased to the highest level since 1943, and imports reached a record-shattering total of 541,864 tons, a gain of 36 percent over the record peacetime high in 1949. Recovery of lead from secondary sources, which had been decreasing since 1947, gained 17 percent in 1950 and exceeded domestic mine output for the fifth consecutive year.

Despite the unpredicted rise in demand for lead during the latter part of the year, there was no apparent stringency in lead supply until just before the year end. On December 28, 1950, the National Pro-

[1] This report deals primarily with the smelting, refining, and consuming phases of the industry. For details of mining operations, see the various State chapters of this volume.

duction Authority issued an antihoarding order, which included lead, among other scarce materials, and limited the accumulation of such materials to quantities needed for "reasonable demands of business, personal, or home consumption."

Labor difficulties during the year caused some losses in production but not to the extent of 1948 and 1949. Toward the end of 1950 there were indications of a decline in the availability of labor in some mining districts, which forecast a possible obstruction to further expansion of domestic mine production in 1951.

TABLE 1.—Salient statistics of the lead industry in the United States, 1941–45 (average) and 1946–50, in short tons

	1941–45 (average)	1946	1947	1948	1949	1950
Production of refined primary lead:						
From domestic ores and base bullion	419, 081	293, 309	381, 109	339, 413	404, 449	418, 809
From foreign ores and base bullion	84, 072	44, 888	59, 901	67, 281	72, 889	89, 505
Total	503, 153	338, 197	441, 010	406, 694	477, 338	508, 314
Recovery of secondary lead	351, 393	392, 787	511, 970	500, 071	412, 183	482, 275
Imports (general):						
Lead in pigs, bars, and old	268. 909	118, 042	175, 538	276, 013	289, 889	461, 883
Lead in base bullion	14, 642	125	1, 580	7, 186	2, 373	3, 488
Lead in ores and matte	78, 999	44, 286	50, 752	63, 907	107, 279	76, 493
Exports of refined pig lead	7, 047	598	1, 523	411	969	2, 735
Consumption of primary and secondary lead	1, 075, 249	956, 476	1, 172, 000	1, 133, 895	957, 674	1, 237, 981
Prices (cents per pound):						
New York:						
Average for period	6. 35	8. 11	14. 67	18. 04	15. 36	13. 30
Quotation at end of period	6. 37	12. 55	15. 00	21. 50	12. 00	17. 00
London average for period	4. 59	8. 63	15. 27	17. 16	16. 95	13. 29
Mine production of recoverable lead [1]	443, 734	335, 475	384, 221	390, 476	409, 908	430, 827
World smelter production of lead	1, 605, 000	[2] 1, 165, 000	[2] 1, 455, 000	[2] 1, 523, 000	[2] 1, 742, 000	1, 874, 000

[1] Includes Alaska.
[2] Revised figure.

DOMESTIC PRODUCTION

Statistics on lead output may be prepared on a mine or smelter and refinery basis. Mine-production data, compiled on the basis of lead content in ores and concentrates, adjusted to account for average losses in smelting, are a better measure of domestic output from year to year and are most accurate for showing the geographic distribution of production. Pig-lead output, as reported by smelters and refiners, presents a more precise figure of actual lead recovery but indicates only in a general way the source of crude material treated. Smelter and refinery output generally differs from the mine figure owing to the lag between mine shipments and smelter treatment of ores and concentrates.

MINE PRODUCTION

Domestic mine output of recoverable lead rose 5 percent in 1950 compared with 1949 and was the largest since 1943. Except for January, production during the first half of the year was at a rate consistently above the 1,180-ton average daily output for the entire year. Production during the latter half of the year, however, declined somewhat, and the daily output, with the exception of November, remained below the annual average.

Production in 11 of the 22 lead-producing States in 1950 exceeded the rates established in 1949. In California the production surpassed any other year in the State's history, and a similar record was established in Washington. Not since 1927 have Colorado mines produced as much lead as was recovered in 1950. Lead output in Idaho, Montana, and Oklahoma reached the highest point since 1942, and production from Missouri mines approached the 1946 output.

Of the total lead produced at United States mines in 1950, 69 percent came from 25 properties. Missouri continued to rank first among the States in the production of lead, and the Southeastern Missouri district continued to be the largest lead-producing area, supplying 31 percent of the total domestic output. As in previous years, the St. Joseph Lead Co. produced the bulk of the output from its Bonne Terre, Desloge, Federal, and Leadwood mine groups in St. Francois County and the Mine La Motte property in Madison County. Each mine is equipped with a mill; the five have a combined daily capacity of about 28,800 tons of ore. In Madison County the National Lead Co., St. Louis Smelting & Refining Division, operated its Madison lead-copper mine and 1,200-ton flotation mill at Fredericktown. The Catherine-Fleming mine was operated part of the year by the Fredericktown Lead Co.

The Tri-State district produced 7 percent of the total domestic lead output in 1950. Owing to low concentrate prices, production was retarded during the first quarter of the year. In the second quarter increased zinc prices stimulated ore production somewhat, but the greatest gain in output occurred in the latter half of the year when the zinc price continued to advance and the lead quotation rose sharply. The five leading Tri-State lead-producing companies in 1950, in order of output, were: Eagle-Picher Mining & Smelting Co., Nellie B. Mining Co., National Lead Co. St. Louis Smelting & Refining Division, Federal Mining & Smelting Co., and the W. M. & W. Mining Co. In December 1950 there were 16 mine mills, 1 tailings mill, and 3 clean-up mills operating, compared with 18 mine mills, 1 tailings mill, and 1 clean-up mill operating in December 1949. About 80 mines were operating in December 1950, compared with 85 in December 1949. Increased activity in open-pit operations during the year indicated the growing importance of this mode of mining in the district.

Mine production of recoverable lead in the combined Western States increased 6 percent in 1950. During the year lead mines in the region contributed nearly 60 percent of the total domestic production compared with 59 percent in 1949.

Idaho continued to be the largest producer of lead in the Western States and second only to Missouri in the United States. In 1950, 95 percent of all Idaho lead came from the Coeur d'Alene region. The Bunker Hill & Sullivan mine at Kellogg was by far the largest producer. Other large producers, all in the Coeur d'Alene region, included the Page, Star, Morning, Sherman, Dayrock, and Sidney mines. These seven properties accounted for 70 percent of the State total lead output, 78 percent of which came from zinc-lead ore and old tailings.

Lead production in Utah in 1950 declined 16 percent from the 1949 output largely as a result of a shut-down of the United States & Lark property at Bingham. The Lark mine was closed from July 16 through October 28 because of a fire in the lower levels; the United

States mine was idle 2 months owing to a labor strike. Despite these difficulties, which reduced lead output in 1950 about 15 percent below 1949, the United States & Lark property remained by far the largest producer of lead in Utah. Production from the United States & Lark property, Chief Consolidated Mining Co., Park Utah Consolidated Mines Co., New Park Mining Co., Butterfield group, Silver King Coalition Mines Co., and Hidden Treasure, Honorine, and Calumet mines supplied 95 percent of the State total lead. Of this total 88 percent was recovered from zinc-lead ore.

Lead production from Colorado mines in 1950 increased slightly over 1949 and was the largest since 1927. The important lead producing mines, in order of rank, were the Resurrection, Treasury Tunnel-Black Bear (Idarado), Smuggler Union-Montana, Eagle, and Emperius Mining Co. group. Zinc-lead ore yielded 63 percent of the State total lead in 1950.

The output of lead in Arizona in 1950 dropped 21 percent below the record level established in 1949 owing largely to a decline in production of zinc-lead ore from the Copper Queen mine at Bisbee. Although lead production at the Copper Queen mine dropped 44 percent, the mine continued as the largest producer in Arizona. Other important producers of lead, in order of output, were the St. Anthony property at Tiger, Iron King mine at Humboldt, San Xavier mine near Sahuarita, Flux group near Patagonia, and Aravaipa group near Klondike. About 92 percent of the total lead output in Arizona in 1950 was recovered from zinc-lead ore, and the rest was recovered largely from lead ore.

Montana's production of recoverable lead in 1950 increased 9 percent owing to a substantial gain in output of zinc-lead ore from the Butte Hill mines and dumps of the Anaconda Copper Mining Co. Anaconda company-owned operations in 1950 accounted for 69 percent of the State lead; other important operations producing lead were the Emma mine at Butte, the Mike Horse property at Flesher, and Jack Waite mine in Sanders County. These four producers supplied 87 percent of the total lead produced in the State in 1950. Of this total 90 percent was recovered from zinc-lead ore and most of the remainder from lead ore.

The closing of the Copper Canyon Mining Co. mine in Lander County, Nev., early in June 1950, following a shaft fire, is reflected in the 11-percent decline in lead production in that State as compared with 1949. The Pioche district, Lincoln County, was again the principal source of Nevada's lead output, contributing 72 percent of the State's total production. The leading producers were: The Combined Metals Reduction Co., Pioche group; Copper Canyon Mining Co., Copper Canyon mine; Ely Valley Mines, Inc., Ely Valley mine; Bristol Silver Mines Co., Bristol mine; and McFarland and Hullinger, Delno mine. Nearly 73 percent of the Nevada lead output in 1950 was recovered from zinc-lead ore.

California 1950 lead production broke a record of 33 years' standing. The new record was achieved largely because Anaconda Copper Mining Co. developed the Darwin group of mines, Coso district, and the Shoshone group, Resting Spring district, Inyo County, to the extent that adequate lead and zinc-lead ores were available to assure continuity of operation at both properties throughout the year. Other important lead mines operated in California in 1950 included the Coronado Copper and Zinc Co., Afterthought mine; Lewis Warnken, Jr., Gold Bottom mine dump; George Lippincott, Lead King mine; and Finley and Vignich, Minnietta mine.

Lead production in Washington in 1950 increased 61 percent over 1949; this was the largest annual output of any year in the State's history. Largely responsible for the record production were substantial increases in output from the Grandview mine in Pend Oreille County and the Bonanza mine in Stevens County. Lead production declined slightly at the Deep Creek and Anderson mine in Stevens County and at the property of the Pend Oreille Mines & Metals Co. in Pend Oreille County. These properties supplied over 99 percent of the Washington lead in 1950. About 72 percent of the total output was derived from zinc-lead ore and nearly all the remainder from lead ore.

Lead production in New Mexico in 1950 declined 11 percent from the 1949 output. The principal producers during the year were the Groundhog mine in the Central district, Lynchburg property in the Magdalena district, Bayard mine in the Central district, and Portales mine in the Hansonberg district. Over 55 percent of the State total lead in 1950 was recovered from zinc ore, 25 percent from zinc-lead ore, and most of the remainder from lead ore.

TABLE 2.—Mine production of recoverable lead in the United States, 1941–45 (average) and 1946–50, by States, in short tons

State	1941–45 (average)	1946	1947	1948	1949	1950
Western States and Alaska:						
Alaska	266	115	264	329	51	149
Arizona	16,742	23,930	28,566	29,899	33,568	26,383
California	5,468	9,923	10,080	9,110	10,318	15,831
Colorado	16,106	17,036	18,696	25,143	26,853	27,007
Idaho	93,451	59,987	78,944	88,544	79,299	100,025
Montana	16,148	8,280	16,108	18,411	17,996	19,617
Nevada	6,534	7,175	7,161	9,777	10,626	9,408
New Mexico	5,985	4,899	6,383	7,653	4,652	4,150
Oregon	18	2	12	7	12	17
South Dakota	32		8	16	4	
Texas	76	47	78	170	132	129
Utah	60,025	30,711	49,698	55,950	53,072	44,753
Washington	4,681	2,987	5,359	7,147	6,417	10,334
Wyoming	1					
Total	225,533	165,092	221,357	252,156	243,000	257,803
West Central States:						
Arkansas	3	2	18	22	1	9
Kansas	9,987	6,445	7,285	8,386	9,772	9,487
Missouri	180,325	139,112	132,246	102,288	127,522	134,626
Oklahoma	18,834	13,697	14,289	16,918	19,858	20,724
Total	209,149	159,256	153,838	127,614	157,153	164,846
States east of the Mississippi River:						
Illinois	2,348	3,865	2,325	3,695	3,824	2,729
Kentucky	231	95	214	216	187	66
New York	1,879	1,073	1,496	1,231	1,317	1,484
Tennessee	103	125	22		257	113
Virginia	3,269	4,381	3,803	4,703	3,313	3,254
Wisconsin	1,222	1,588	1,166	861	857	532
Total	9,052	11,127	9,026	10,706	9,755	8,178
Grand total	443,734	335,475	384,221	390,476	409,908	430,827

Mine production of lead in States east of the Mississippi River came from properties in Illinois, Kentucky, New York, Tennessee, Virginia, and Wisconsin and was largely a byproduct or co-product of zinc and fluorspar mining. Most of the decline in lead output in this region in 1950 can be attributed to a smaller production from fluorspar mines and to the closing of the Patrick mine in Southern Illinois by the Alco Lead Corp., which went out of business in the latter part of 1949. Zinc-lead mines in Wisconsin and Northern Illinois also recorded declines in production, and some output was lost owing to the closing on May 15 of the Universal Exploration Co.'s Hyatt mine in New York. A labor strike at the Austinville mine of the New Jersey Zinc Co. from October 9 to November 23 resulted in a 2-percent decrease in the output of lead in Virginia.

TABLE 3.—Mine production of recoverable lead in the United States by districts that produced 1,000 tons or more during any year, 1941–45 (average) and 1946–50, in short tons

District	State	1941–45 (average)	1946	1947	9148	1949	1950
Southeastern Missouri region	Missouri	176, 654	135, 796	129, 516	100, 654	126, 269	133, 680
Coeur d'Alene region	Idaho	86, 412	56, 548	73, 060	82, 587	74, 152	94, 697
Tri-State (Joplin region)	Kansas, southwestern Missouri, Oklahoma.	32, 352	23, 363	24, 239	26, 901	30, 883	31, 157
West Mountain (Bingham)	Utah	32, 767	12, 343	26, 163	30, 672	32, 600	27, 472
Summit Valley (Butte)	Montana	5, 049	2, 357	10, 630	13, 217	11, 490	15, 679
Coso (Darwin)	California	2, 207	7, 708	6, 551	6, 078	4, 928	8, 479
Warren (Bisbee)	Arizona	3, 078	10, 889	13, 422	11, 253	13, 865	7, 790
Upper San Miguel	Colorado	1, 725	2, 376	2, 559	3, 804	5, 285	7, 780
Park City region	Utah	14, 194	8, 373	10, 987	12, 670	8, 583	7, 538
Metaline	Washington	4, 347	2, 224	3, 450	4, 297	4, 030	7, 445
Pioche	Nevada	3, 914	3, 493	3, 487	5, 613	6, 630	6, 761
Tintic	Utah	7, 622	4, 239	6, 166	5, 970	6, 676	6, 520
California (Leadville)	Colorado	4, 036	4, 441	4, 296	4, 745	5, 080	6, 392
Old Hat	Arizona	3, 298	4, 790	4, 603	5, 406	6, 788	5, 980
Big Bug	Arizona	1, 183	2, 155	2, 323	2, 676	3, 330	4, 357
Austinville	Virginia	3, 054	4, 381	3, 803	4, 703	3, 313	3, 254
Animas	Colorado	2, 535	3, 207	2, 241	1, 886	2, 935	3, 069
Pima (Sierritas, Papago, Twin Buttes).	Arizona	1, 020	2, 296	2, 909	3, 917	4, 232	2, 996
Warm Springs	Idaho	3, 686	1, 649	1, 879	1, 304	2, 339	2, 648
Bossburg	Washington	48	428	1, 010	1, 394	2, 011	2, 640
Central	New Mexico	4, 097	3, 199	3, 450	3, 740	2, 479	2, 315
Red Cliff	Colorado	1, 545	690	924	1, 120	1, 600	2, 110
Harshaw	Arizona	3, 689	692	1, 393	1, 999	1, 546	1, 931
Upper Mississippi Valley	Iowa, northern Illinois, Wisconsin.	1, 405	1, 861	1, 816	1, 807	2, 046	1, 801
Bayhorse	Idaho	1, 575	553	2, 039	1, 880	1, 073	1, 679
Kentucky-Southern Illinois	Kentucky, southern Illinois.	2, 396	3, 687	1, 889	2, 965	2, 822	1, 526
Aravaipa	Arizona	166	467	794	1, 142	1, 271	1, 498
St. Lawrence County	New York	1, 879	1, 073	1, 496	1, 231	1, 317	1, 484
Creede	Colorado	491	246	329	451	1, 162	1, 422
Rush Valley & Smelter (Tooele County).	Utah	3, 618	3, 490	3, 829	4, 185	2, 953	1, 393
Pioneer (Rico)	Colorado	2, 528	2, 176	2, 042	2, 430	1, 388	1, 138
Eagle	Montana	1, 720	469	393	600	1, 024	1, 013
Ophir	Utah	1, 000	336	790	791	1, 089	948
Heddleston	Montana	2, 244	2, 648	2, 087	1, 946	2, 335	930
Magdalena	New Mexico	1, 094	1, 273	1, 987	2, 826	1, 162	926
Ten Mile	Colorado	338	810	1, 167	4, 177	3, 671	910
Sneffels	Colorado	366	(1)	(1)	756	1, 064	866
Tomichi	Colorado	218	333	1, 458	1, 788	1, 221	645
Battle Mountain	Nevada	71	45	39	234	1, 290	564
Eureka	Colorado	38	300	630	1, 107	578	323
Northport (Aladdin)	Washington	140	39	508	1, 426	342	237
Modoc	California	193	279	139	1, 061	729	87
Alder Creek	Idaho	36	136	1, 103	776	442	62
Resting Springs [2]	California	(1)	(1)	(1)	(1)	(1)	(1)

[1] Figure not shown in order to avoid disclosure of individual company operations.
[2] This district is not listed in order of 1950 output.

TABLE 4.—Twenty-five leading lead-producing mines in the United States in 1950, in order of output

Rank	Mine	District	State	Operator	Type of ore
1	Federal	Southeastern Missouri	Missouri	St. Joseph Lead Co	Lead.
2	Bunker Hill & Sullivan	Yreka	Idaho	Bunker Hill & Sullivan Mining & Concentrating Co.	Zinc-lead.
3	United States and Lark	West Mountain (Bingham)	Utah	U. S. Smelting, Refining & Mining Co	Do.
4	Leadwood	Southeastern Missouri	Missouri	St. Joseph Lead Co	Lead.
5	Butte Hill mines and dumps	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Zinc-lead.
6	Mine La Motte	Southeastern Missouri	Missouri	St. Joseph Lead Co	Lead.
7	Page	Yreka	Idaho	Federal Mining & Smelting Co	Zinc-lead.
8	Bonne Terre	Southeastern Missouri	Missouri	St. Joseph Lead Co	Lead.
9	Darwin group	Coso	California	Anaconda Copper Mining Co	Do.
10	Star	Hunter	Idaho	Sullivan Mining Co	Zinc-lead.
11	Copper Queen	Warren (Bisbee)	Arizona	Phelps Dodge Corp	Do.
12	Shoshone group	Resting Springs	California	Anaconda Copper Mining Co	Lead.
13	Madison	Southeastern Missouri	Missouri	St. Louis Smelting & Refining Co	Lead-copper.
14	Morning	Hunter	Idaho	Federal Mining & Smelting Co	Zinc-lead.
15	Combined Metals group	Pioche	Nevada	Combined Metals Reduction Co	Do.
16	Desloge	Southeastern Missouri	Missouri	St. Joseph Lead Co	Lead.
17	Chief and Eureka Hill	Tintic	Utah	Chief Consolidated Mining Co	Zinc-lead.
18	Mammoth-Collins	Old Hat	Arizona	St. Anthony Mining & Development Co	Do.
19	Resurrection	Leadville	Colorado	Resurrection Mining Co	Do.
20	Treasury Tunnel-Black Bear	Upper San Miguel	Colorado	Idarado Mining Co	Do.
21	Grandview	Metaline	Washington	American Zinc Lead Smelting Co	Do.
22	Iron King	Big Bug	Arizona	Shattuck-Denn Mining Co	Do.
23	Sherman	Lelande	Idaho	Day Mines, Inc	Lead.
24	Dayrock	Placer Center	Idaho	Day Mines, Inc	Do.
25	Sidney group	Yreka	Idaho	Sidney Mining Co	Zinc-lead.

Lead was also recovered in 1950 from ores mined in Oregon, Texas, and Arkansas. Virtually all the 149 tons of lead produced in Alaska in 1950 was recovered from the output of the Riverside mine near Hyder in the Southeastern Alaska region.

The 25 leading lead-producing mines in the United States in 1950, listed in table 4, yielded 69 percent of the total domestic output; the 8 leading mines produced 46 percent and the 4 leading mines 36 percent.

Detailed information on the production of mines and mining districts in the United States may be found in the chapters of this volume dealing with the mine production of gold, silver, copper, lead, and zinc in the various States.

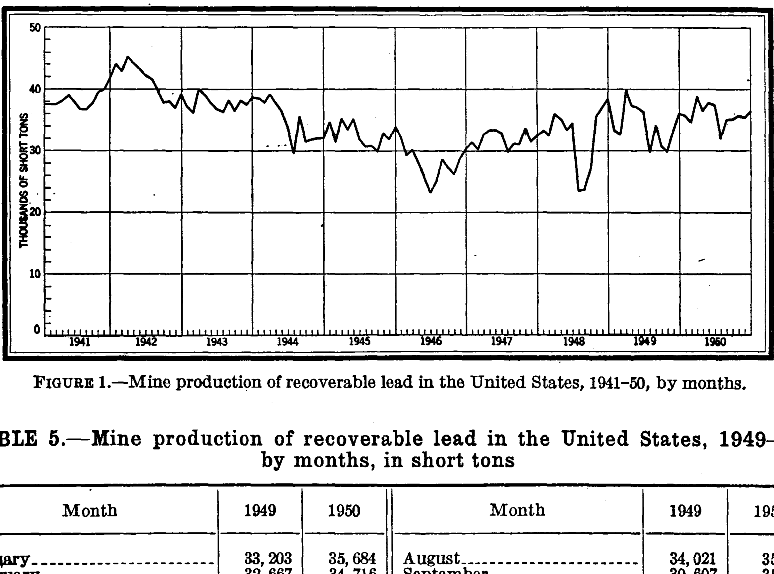

FIGURE 1.—Mine production of recoverable lead in the United States, 1941–50, by months.

TABLE 5.—Mine production of recoverable lead in the United States, 1949–50, by months, in short tons

Month	1949	1950	Month	1949	1950
January	33,203	35,684	August	34,021	35,020
February	32,667	34,716	September	30,607	35,087
March	39,916	38,960	October	29,887	35,730
April	37,215	36,432	November	33,225	35,419
May	37,006	37,906	December	36,047	36,397
June	36,278	37,439			
July	29,836	32,037	Total	409,908	430,827

SMELTER AND REFINERY PRODUCTION

Pig (refined) lead produced in the United States is derived from three principal sources—domestic mine production, imports of foreign ores and base bullion, and scrap materials (treated largely at secondary smelters)—and is recovered at primary refineries that treat ore, base bullion, and small quantities of scrap and at secondary plants that process scrap exclusively. Of the 13 primary lead plants in the United States, 6 combine smelting and refining operations, 5 produce only base bullion (containing approximately 98 percent lead plus gold and silver, and small quantities of other impurities recovered from the ores smelted), and 2 confine their activities to refining. Refined lead and antimonial, or "hard," lead may be produced by both primary and secondary plants. Because of the large quantity of hard lead, such as battery scrap, melted at secondary smelters, the output from this type of operation is essentially antimonial lead. Statistics on the production of refined lead and alloys at secondary plants are given in the Secondary Lead section of this chapter.

Of the 13 primary smelters in operation in 1950, all but 2 consumed substantial quantities of primary materials in the form of ores and concentrates. During the year these 11 plants consumed 511,433 short tons (lead content) of this type of material, of which 17 percent was of foreign origin. In 1949, 467,128 tons of ores and concentrates were consumed, 16 percent of which was foreign.

Active Lead Smelters and Refiners.—Primary lead smelters and refineries operating in the United States in 1950 were as follows:

California: Selby—Selby plant, American Smelting & Refining Co. (smelter and refinery).
Colorado: Leadville—Arkansas Valley plant, American Smelting & Refining Co. (smelter).
Idaho: Bradley—Bunker Hill Smelter, Bunker Hill & Sullivan Mining & Concentrating Co. (smelter and refinery).
Illinois: Alton—Federal plant, American Smelting & Refining Co. (smelter and refinery).
Indiana: East Chicago—U. S. S. Lead Refinery, Inc. (refinery).
Kansas: Galena—Galena plant, Eagle-Picher Co. (smelter and refinery).
Missouri: Herculaneum—Herculaneum plant, St. Joseph Lead Co. (smelter and refinery).
Montana: East Helena—East Helena plant, American Smelting & Refining Co. (smelter).
Nebraska: Omaha—Omaha plant, American Smelting & Refining Co. (refinery).
New Jersey: Barber—Perth Amboy plant, American Smelting & Refining Co. (smelter and refinery).
Texas: El Paso—El Paso plant, American Smelting & Refining Co. (smelter).
Utah:
- Midvale—Midvale plant, United States Smelting, Refining & Mining Co. (smelter).
- Tooele—Tooele plant, International Smelting & Refining Co. (smelter).

REFINED LEAD

Primary refineries in the United States in 1950 produced 513,769 short tons of refined lead, an increase of 3 percent over the 1949 output of 500,568 tons.

Of the 508,314 tons of primary refined lead produced during the year, domestic ores and base bullion were the source for 82 percent and imported ores and foreign base bullion for 18 percent. In 1949 the

TABLE 6.—Refined lead produced at primary refineries in the United States, by sources, 1946–50, in short tons

	1946	1947	1948	1949	1950
Refined lead:					
From domestic ores and base bullion	293, 309	381, 109	339, 413	404, 449	418, 809
From foreign ores	44, 790	59, 838	60, 829	71, 413	86, 241
From foreign base bullion	98	63	6, 452	1, 476	3, 264
Total from primary sources	338, 197	441, 010	406, 694	477, 338	508, 314
From scrap	8, 013	15, 662	4, 952	23, 230	5, 455
Total refined lead	346, 210	456, 672	411, 646	500, 568	513, 769
Average sales price per pound	$0. 084	$0. 143	$0. 179	$0. 158	$0. 135
Total calculated value of primary refined lead [1]	$56, 820, 000	$126, 130, 000	$145, 600, 000	$150, 840, 000	$137, 245, 000

[1] Excludes value of refined lead produced from scrap at primary refineries.

origin was 85 percent domestic and 15 percent foreign. Table 7 gives the production of refined lead by sources and by country of origin of the ore. Details of the sources of lead from domestic ores are given in the Mine Production section of this chapter.

TABLE 7.—Refined primary lead produced in the United States, by country of origin, 1946–50, in short tons

Source	1946	1947	1948	1949	1950
Domestic ore and base bullion	293,309	381,109	339,413	404,449	418,809
Foreign ore:					
Australia	7,534	5,952	6,729	6,465	6,984
Canada	5,026	3,548	3,608	3,317	7,892
Europe			43	30	
Mexico	2,056	5,523	4,427	8,477	5,992
South America	11,344	17,096	24,589	29,163	38,770
Other foreign	18,830	27,719	21,433	23,961	26,603
Total	44,790	59,838	60,829	71,413	86,241
Foreign base bullion:					
Australia			466	1,382	2,427
Mexico	10	30	5,637	36	435
South America	88	33	52	58	402
Other foreign			297		
Total	98	63	6,452	1,476	3,264
Total foreign	44,888	59,901	67,281	72,889	89,505
Grand total	338,197	441,010	406,694	477,338	508,314

ANTIMONIAL LEAD

Antimonial lead output at primary refineries in 1950 rose slightly above the 1949 level but was well below the record high established in 1948. Production increased at three of the five primary plants producing the alloy. Distribution of antimonial lead production at primary refineries in 1946–50 by source material is shown in table 8, as is also the average antimony content.

Although antimonial lead is an important byproduct of the refining of base bullion, the quantity derived from this source is only a small part of total domestic output. The major production is recovered from the smelting of antimonial lead scrap at secondary smelters. Production data from lead smelting plants treating scrap materials exclusively are summarized in the following section and discussed in detail in the Secondary Metals—Nonferrous chapter of this volume.

TABLE 8.—Antimonial lead produced at primary lead refineries in the United States, 1946–50

Year	Production (short tons)	Antimony content		Lead content by difference (short tons)			
		Short tons	Percent	From domestic ore	From foreign ore	From scrap	Total
1946	50,480	3,285	6.5	11,196	2,149	33,850	47,195
1947	86,075	4,933	5.7	14,836	9,850	56,456	81,142
1948	100,764	5,760	5.7	29,561	15,918	49,525	95,004
1949	41,402	3,385	8.2	692	4,620	32,705	38,017
1950	57,959	4,504	7.8	10,728	4,344	38,383	53,455

SECONDARY LEAD

Some scrap lead is treated at primary smelters, but the greater part is received at a large number of plants that specialize in the treatment of secondary materials. Secondary lead is recovered in the form of refined lead, antimonial lead, and other alloys.

Secondary lead recovery in 1950 was 17 percent above the 1949 figure and exceeded the domestic mine output of recoverable lead for the fifth consecutive year. Data on recovery, by type of plant, in 1946–50 are shown in table 9.

TABLE 9.—Secondary lead recovered in the United States, 1946–50, in short tons

	1946	1947	1948	1949	1950
As refined metal:					
At primary plants	8,013	15,662	4,952	23,230	5,455
At other plants	65,691	95,843	126,951	129,396	123,858
Total	73,704	111,505	131,903	152,626	129,313
In antimonial lead:					
At primary plants	33,850	56,456	49,525	32,705	38,383
At other plants	159,834	209,479	194,027	140,037	187,257
Total	193,684	265,935	243,552	172,742	225,640
In other alloys	125,399	134,530	124,616	86,815	127,322
Grand total:					
Short tons	392,787	511,970	500,071	412,183	482,275
Value	$65,988,216	$146,423,420	$179,025,418	$130,249,828	$130,214,250

LEAD PIGMENTS

The principal lead pigments are litharge, white lead, red lead, sublimed lead, leaded zinc oxide, and orange mineral. These products are manufactured for the most part from metal, but some ore and concentrates are converted directly into pigments. Details of the production of lead pigments are given in the Lead and Zinc Pigments and Zinc Salts chapter of this volume.

CONSUMPTION AND USES

Domestic lead consumption (including lead in lead ore consumed directly in the manufacture of lead pigments and salts) totaled 1,237,981 short tons in 1950. Of the total consumed, 826,938 tons was refined soft lead, and 259,874 tons was contained in antimonial lead, 42,518 tons in unmelted white scrap, 50,311 tons in "percentage metals," 21,575 tons in copper-base scrap, 22,098 tons in drosses and residues, and 14,667 tons in lead ores used directly in the manufacture of lead compounds. During the year, 42 percent of total lead consumed was used in the manufacture of various metal products (other than storage batteries). Production of the three largest lead-consuming items—batteries, cable coverings, and tetraethyl fluid—used 52 percent of all the lead consumed in 1950. Batteries took 32 percent of the total, cable covering 11 percent, and tetraethyl fluid 9 percent.

TABLE 10.—Consumption of lead in the United States in 1949 and 1950, in short tons

	1949	1950		1949	1950
Metal products:			Pigments:		
Ammunition	24,111	38,438	White lead	18,400	36,181
Bearing metals	29,189	38,241	Red lead and litharge	70,832	101,974
Brass and bronze	14,946	21,461	Pigment colors	8,400	13,464
Cable covering	144,340	131,989	Other [2]	9,515	14,768
Calking lead	34,944	53,450			
Casting metals	12,672	19,295	Total pigments	107,147	166,387
Collapsible tubes	8,692	13,386			
Foil	2,503	3,941	Chemicals:		
Pipes, traps, and bends	29,858	41,361	Tetraethyl lead	94,644	113,846
Sheet lead	27,144	30,778	Miscellaneous chemicals	4,191	11,680
Solder	62,104	94,606			
Terne metal	3,256	3,805	Total chemicals	98,835	125,526
Type metal	20,695	24,776			
			Miscellaneous uses:		
Total metal products	414,454	515,527	Annealing	4,935	6,456
			Galvanizing	1,228	2,426
Storage batteries: [1]			Lead plating	997	1,521
Antimonial lead	175,308	212,464	Weights and ballast	4,627	6,870
Lead oxides	138,410	185,945			
			Total miscellaneous uses	11,787	17,273
Total storage batteries	313,718	398,409	Other, unclassified uses	11,733	14,859
			Grand total	957,674	1,237,981

[1] Formerly classified under "metal products."
[2] Includes lead content of leaded zinc oxide production.

TABLE 11.—Consumption of lead in the United States 1949–50, by months, in short tons [1]

Month	1949	1950	Month	1949	1950
January	91,769	83,671	August	101,104	127,317
February	78,186	78,491	September	93,718	121,782
March	71,076	88,939	October	87,475	126,599
April	62,753	84,673	November	79,053	116,304
May	70,272	100,620	December	73,457	110,456
June	73,206	103,443			
July	75,605	95,686	Total	957,674	1,237,981

[1] Includes lead content of leaded zinc oxide production.

TABLE 12.—Lead consumption in the United States in 1950, by class of product and type of material, in short tons

	Soft and antimonial lead	Scrap, percentage metal, drosses, etc.	Total
Metal products	384,734	130,793	515,527
Storage batteries [1]	394,706	3,703	398,409
Pigments	151,680	40	151,720
Chemicals	125,526		125,526
Miscellaneous	16,344	929	17,273
Unclassified	13,822	1,037	14,859
Total	1,086,812	136,502	[2] 1,223,314

[1] Formerly classified under metal products.
[2] Excludes 14,667 tons of lead contained in leaded zinc oxide.

STOCKS

Producers' Stocks.—Lead stocks, as reported by the American Bureau of Metal Statistics, are shown in table 13. Stocks of refined and antimonial lead include metal held by all primary refiners and by some of the refiners of secondary metal who produce soft lead. According to monthly reports released by the American Bureau of Metal Statistics, stocks of refined lead and antimonial lead increased in January, February, March, and April to reach the year's peak of 88,581 tons on April 30. Inventories declined steadily thereafter, totaling 40,910 tons on December 31, a net decrease of 42 percent from the January 1 figure of 70,424.

TABLE 13.—Lead stocks at end of year at smelters and refineries in the United States, 1946–50, in short tons

[American Bureau of Metal Statistics]

	1946	1947	1948	1949	1950
Refined pig lead	40,870	13,634	29,050	61,329	28,894
Antimonial lead	6,717	7,694	9,594	9,095	6,725
Total	47,587	21,328	38,644	70,424	35,619
Lead in base bullion—					
At smelters and refineries	8,453	7,652	9,697	16,364	11,993
In transit to refineries	4,911	5,447	4,101	3,696	4,959
In process at refineries	16,042	16,328	17,939	15,561	15,341
Total	29,406	29,427	31,737	35,621	32,293
Lead in ore and matte and in process at smelters	111,836	77,199	76,373	95,481	69,757
Grand total	188,829	127,954	146,754	201,526	137,669

The Bureau of Mines annual survey of primary lead smelters and refiners indicated stocks of 60,816 (revised) tons (lead content) of refined soft lead at plants on January 1, 1950, and 28,894 tons on December 31, 1950. Primary antimonial lead stocks at these same plants decreased from 8,192 short tons (lead content) at the beginning of 1950 to 6,152 tons at the end of the year. In terms of lead content, stocks of ore and concentrates at the operating primary smelters and refineries decreased 31 percent, from 61,753 (revised) tons to 42,346 tons during the same period. The inventory of base bullion at refineries that receive base bullion as a raw material and at smelters that produce base bullion for shipment to refineries totaled 7,893 tons at the beginning of January and 11,658 tons at the end of December 1950. Stocks of in-process base bullion or work lead at four combination smelter-refinery plants are not included in reports to the Bureau of Mines. No direct comparison can be made between these data and the figures of the American Bureau of Metal Statistics. Figures reported to the Bureau of Mines represent physical inventory at the plants, irrespective of ownership, and do not include material in process or in transit.

Consumers' Stocks.—Consumers' stocks of lead increased 41 percent during 1950. Stocks of lead in copper-base scrap decreased 20 percent, but there were increases in all other classes, with refined soft lead advancing 33 percent and antimonial lead 56 percent. Total inventories showed a downward trend from the 97,267 tons at the beginning of the year to a low of 86,898 tons on September 30 but gained considerably each month thereafter to total 137,147 tons on December 31.

TABLE 14.—Consumers' stocks of lead at end of year, 1947–50, by type of material, in short tons, lead content

Date	Refined soft lead	Antimonial lead	Unmelted white scrap	Percentage metals	Copper-base scrap	Drosses, residues, etc.	Total
Dec. 31, 1947	51,619	22,402	3,514	6,247	1,938	5,624	91,344
Dec. 31, 1948	62,077	35,088	4,828	7,932	2,301	6,972	119,198
Dec. 31, 1949	64,542	16,837	2,957	5,405	2,087	5,439	97,267
Dec. 31, 1950	86,101	26,252	5,720	6,308	1,676	11,090	137,147

PRICES

The two major markets for lead in the United States are New York and St. Louis. Much of the lead produced domestically is sold at prices normally based upon quotation in these markets. Since suspension of trading on the London Metal Exchange in September 1939, the London market has had no direct influence on New York quotations, and the differential between St. Louis and New York prices has remained 0.2 cent a pound, an amount approximating the freight charges between the two cities.

The market price for common lead, New York, opened on January 1 at 12.00 cents per pound. Cautious buying caused the price to decline on March 9 to 11.00 cents and on March 14 to 10.50 cents. Renewed consumer interest advanced the price temporarily to 10.75 cents on April 20 and to 12.00 cents on May 11. Declining sales thereafter resulted in a drop in the quotation, which reached 11.00 cents on June 28. Developments in Korea and renewed demand for the metal arrested the downtrend and resulted in a series of advances to 17.00 cents per pound on October 31, at which level the price remained for the balance of the year.

TABLE 15.—Average monthly and yearly quoted prices of lead at St. Louis, New York, and London, 1948–50, in cents per pound [1]

Month	1948			1949			1950		
	St. Louis	New York	London [2]	St. Louis	New York	London [2]	St. Louis	New York	London [2]
January	14.82	15.00	16.17	21.32	21.50	22.10	11.80	12.00	12.11
February	14.82	15.00	16.17	21.32	21.50	22.10	11.80	12.00	12.11
March	14.82	15.00	16.17	18.73	18.91	22.10	10.76	10.96	11.06
April	17.04	17.21	16.17	14.99	15.16	19.28	10.43	10.63	10.57
May	17.32	17.50	16.17	13.57	13.72	17.98	11.52	11.72	11.61
June	17.32	17.50	16.17	11.85	12.00	15.45	11.61	11.81	11.84
July	17.63	17.81	16.17	13.39	13.56	14.59	11.46	11.66	11.58
August	19.32	19.50	16.17	14.80	15.01	15.56	12.73	12.93	12.84
September	19.32	19.50	16.17	14.85	15.05	15.51	15.60	15.80	15.70
October	19.32	19.50	20.12	13.23	13.42	13.79	15.84	16.04	16.00
November	21.32	21.50	20.12	12.33	12.52	12.79	16.80	17.00	17.00
December	21.32	21.50	20.12	11.80	12.00	12.12	16.80	17.00	17.00
Average	17.87	18.04	17.16	15.18	15.36	16.95	13.10	13.30	13.29

[1] St. Louis: Metal Statistics, 1951, p. 511. New York: Metal Statistics, 1951, p. 505. London: E&MJ Metal and Mineral Markets.

[2] Conversion of English quotations into American money based on average rates of exchange recorded by Federal Reserve Board.

The official London price fixed by the Ministry of Supply for the United Kingdom was £97 per long ton (equivalent to 12.11 cents per pound computed on the basis of a $2.7975 exchange rate) at the beginning of 1950. The price was reduced on March 10 to £88 (10.99 cents) and on March 16 to £84 (10.49 cents). It was subsequently raised on April 21 to £86 (10.74 cents), April 27 to £88, May 5 to £90 (11.24 cents), May 11 to £92 (11.49 cents), and May 12 to £96 (11.99 cents). On June 24 it was dropped to £92 (11.50 cents at the $2.80 exchange rate established on June 1) and again on June 29 to £88 (11.00 cents). The final uptrend for the year started on July 13, when the price was raised once more to £92, followed on July 14 by an increase to £96 (12.00 cents) and other increases on August 16 to £104 (13.00 cents), August 22 to £112 (14.00 cents), September 2 to £120 (15.00 cents), September 9 to £128 (16.00 cents), and November 1 to £136 (17.00 cents), at which level it remained for the balance of the year.

FOREIGN TRADE [2]

Tariff.—The import duty set by the Tariff Act of 1930 on lead-bearing ores, flue dust, and mattes (lead content) was 1½ cents per pound and on lead bullion, pigs, bars, scrap lead, antimonial lead, type metal, babbitt metal, solder, and alloys not specially provided for, 2⅛ cents per pound. In accordance with the Mexican Trade Agreement of January 30, 1943, these rates were reduced to ¾ cent and 1$\frac{1}{16}$ cents per pound, respectively. In June 1948 these duties were suspended for 1 year by act of Congress. As the Congress took no action on a bill to extend the suspension beyond June 30, 1949, the expiration date of the original legislation, the import duty of 1$\frac{1}{16}$ cents a pound on pig lead and ¾ cent a pound on lead in ores and concentrates was reinstated automatically on July 1 and continued at these levels throughout 1950. The 1$\frac{1}{16}$ cents per pound duty on lead scrap was suspended by Congressional action for the period October 1, 1950, to June 30, 1951.

Imports.—Imports of lead in 1950 increased 36 percent over 1949 to total 541,864 tons, the largest annual quantity ever recorded. The rise was due largely to the abrogation in mid-1950 of the Mexican Trade Agreement, effective January 1, 1951, restoring as of that date the full duty established by the Tariff Act of 1930. Extraordinarily large quantities of lead were thus imported in the late months of 1950 to avoid payment of the higher tariff rates. The greater part of the lead imported in 1950 was in the form of pigs and bars, 50 percent of which came from Mexico, 24 percent from Canada, 10 percent from Yugoslavia, 7 percent from Peru, 5 percent from Australia, and 4 percent from other countries. Imports of base bullion increased 47 percent over 1949 and came principally from Australia and Japan. Ore and concentrate imports, which had gained in each of the preceding 4 years, dropped 29 percent in 1950 and were chiefly from Africa, Peru, Bolivia, Australia, and Canada.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 16.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, 1946–50, in short tons [1]

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
Ore and matte:					
Africa	399	5,616	10,142	31,373	19,713
Argentina	2,112	6	---------	---------	46
Australia	8,268	7,054	9,017	8,983	9,729
Bolivia	2,202	6,234	20,369	24,098	13,381
Canada-Newfoundland-Labrador	23,929	14,833	8,288	10,326	9,428
Chile	1,456	3,048	3,430	3,395	2,657
Guatemala	---------	---------	23	2,827	325
Mexico	376	3,065	2,702	8,388	2,846
Peru	5,192	10,477	8,548	14,970	16,010
Other countries	352	419	1,388	2,919	2,358
Total ore and matte	44,286	50,752	63,907	107,279	76,493
Base bullion:					
Australia	---------	---------	---------	2,246	2,263
Guatemala	---------	---------	---------	---------	232
Japan	---------	---------	---------	---------	921
Korea	---------	285	82	---------	---------
Mexico	---------	1,255	6,455	25	---------
Peru	125	40	619	102	72
Other countries	---------	---------	30	---------	---------
Total base bullion	125	1,580	7,186	2,373	3,488
Pigs and bars:					
Africa	---------	78	507	280	---------
Australia	8,210	10,639	30,469	17,192	22,009
Belgium-Luxembourg	---------	---------	8,911	212	166
Burma	---------	---------	2,343	1,414	
Canada-Newfoundland-Labrador	23,029	59,079	53,978	56,432	107,673
Germany	---------	---------	---------	8,333	8,643
Italy	---------	---------	21,349	3,419	---------
Japan	15,161	---------	---------	2,108	5,722
Korea	---------	1,659	39	51	---------
Mexico	53,534	85,783	98,460	126,398	220,767
Netherlands	---------	---------	1,826	219	484
Peru	15,568	1,151	23,559	34,626	31,988
Spain	---------	---------	1,653	---------	440
Yugoslavia	---------	1,120	2,889	23,436	43,855
Other countries	1	4	1,133	1,120	51
Total pigs and bars	115,503	159,513	247,116	275,240	441,798
Reclaimed, scrap, etc.:					
Africa	---------	478	344	479	---------
Australia	1,410	1,111	3,690	2,971	1,061
Belgium-Luxembourg	---------	---------	986	329	13
Canada-Newfoundland-Labrador	1,080	8,070	11,687	1,856	1,317
Canal Zone	9	202	447	384	319
Chile	---------	62	---------	---------	---------
France	(2)	---------	(2)	289	---------
Germany	---------	---------	---------	663	290
Italy	---------	69	2,304	346	---------
Japan	---------	5,336	---------	2,765	14,815
Malta, Gozo, Cyprus	---------	78	155	---------	---------
Mexico	1	---------	1,644	845	934
Netherlands	---------	---------	2,460	599	4
Panama	12	41	223	92	80
Philippines	---------	433	2,341	1,144	99
Yugoslavia	---------	---------	652	---------	---------
Other countries	27	145	1,964	1,887	1,153
Total reclaimed, scrap, etc	2,539	16,025	28,897	14,649	20,085
Grand total	162,453	227,870	347,106	399,541	541,864

[1] Data are "general imports," that is, include lead imported for immediate consumption plus material entering the country under bond.

[2] Less than 0.5 ton.

TABLE 17.—Lead imported for consumption in the United States, 1946–50, by classes [1]

[U. S. Department of Commerce]

Year	Lead in ores, flue dust, and mattes, n. s. p. f.		Lead in base bullion		Pigs and bars		Sheets, pipe, and shot		Not otherwise specified (value)	Total value
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value		
1946	28,255	$3,042,765	20	$2,302	104,083	$14,816,926	24	$10,251	$21,517	$18,089,893
1947	44,442	8,561,174	1,758	416,643	158,705	38,008,443	67	42,434	10,453	50,111,298
1948	33,932	8,350,507	10,922	3,239,135	244,692	80,922,779	181	100,519	35,554	100,968,922
1949	121,848	34,397,026	1,133	374,954	272,437	[2]80,148,110	[2]178	101,084	29,830	[2]119,054,978
1950	95,031	21,039,227	1,134	191,879	434,365	104,323,711	207	78,111	78,690	129,697,781

[1] In addition to quantities shown (value included in total values), "reclaimed, scrap, etc.," imported as follows—1946: 2,539 tons, $196,132; 1947: 15,963 tons, $3,072,151; 1948: 28,897 tons, $8,320,428; 1949: Revised figure, 14,076 tons, $4,003,974; 1950: 22,610 tons, $3,986,163. Figures include lead received by the Government and held in stock piles but exclude imports for manufacture in bond and export, which are classified as "imports for consumption" by the Department of Commerce.

[2] Revised figure.

TABLE 18.—Miscellaneous products, containing lead, imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Babbitt metal, solder, white metal, and other combinations containing lead			Type metal and antimonial lead		
	Gross weight (short tons)	Lead content (short tons)	Value	Gross weight (short tons)	Lead content (short tons)	Value
1946	157	83	$211,122	1,740	1,494	$220,645
1947	264	171	208,185	2,406	2,219	753,664
1948	257	184	213,614	14,732	13,163	5,279,080
1949	[1]281	[1]127	[1]459,236	5,861	5,207	2,255,909
1950	4,262	2,647	2,736,360	12,408	10,481	3,396,494

[1] Revised figure.

Exports.—Total exports of pig lead (excluding reexports of foreign refined lead) increased almost threefold, from 969 tons in 1949 to 2,735 tons in 1950. Export restrictions imposed under the Export Control Act of 1940 remained in force throughout 1950.

TABLE 19.—Lead pigs, bars, and anodes exported from the United States, by destinations, 1946–50, in short tons [1]

[U. S. Department of Commerce]

Destination	1946	1947	1948	1949	1950
Countries:					
Argentina	----	894	2	7	----
Belgium-Luxembourg	----	----	----	76	----
Brazil	281	63	1	126	47
Canada-Newfoundland	40	10	8	14	306
Canal Zone	6	52	----	15	19
Chile	2	52	42	40	35
China	9	10	21	----	----
Colombia	49	12	16	60	123
Cuba	58	38	40	68	61
Denmark	----	----	----	131	----

For footnotes, see end of table.

TABLE 19.—Lead pigs, bars, and anodes exported from the United States, by destinations, 1946–50, in short tons [1]—Continued

[U. S. Department of Commerce]

Destination	1946	1947	1948	1949	1950
Countries—Continued					
El Salvador		9	1	34	96
Honduras		[2] 7	1	29	6
Hong Kong		[2] 23	2		4
India	(3)	19	121	4	
Israel				1	174
Madagascar		44			
Mexico	17	16	14	3	3
Netherlands	1	100	1		
Netherlands Antilles	11			(3)	
Pakistan					569
Panama	17	(3)	1	(3)	3
Philippines	16	[2] 24	1	53	306
Portugal				3	2
Saudi Arabia	11	3	24	7	1
Turkey		50	11	7	
United Kingdom					67
Uruguay	10	27		69	734
Venezuela	34	30	71	148	95
Other countries	36	40	33	74	84
Total	598	1,523	411	969	2,735
Continents:					
North America	170	144	75	179	525
South America	381	[2] 1,079	133	475	1,052
Europe	11	[2] 119	10	215	75
Asia	36	[2] 134	189	85	1,068
Africa and Oceania	(3)	[2] 47	4	15	15
Total: short tons	598	1,523	411	969	2,735
value	$107,124	$388,599	$169,075	$356,819	$790,480

[1] In addition 103 tons of foreign lead was reexported in 1946, 102 tons in 1947, none in 1948, 86 tons in 1949, and 53 tons in 1950.
[2] Revised figure.
[3] Less than 0.5 ton.

WORLD REVIEW

Lead is produced in many countries, but four—United States, Mexico, Australia, and Canada—have accounted for about three-fifths of the world output in recent years, as is apparent from tables 20 and 21, which show world mine and smelter production by countries 1944–50, insofar as statistics are available.

TABLE 20.—World mine production of lead, by countries, 1944–50, in metric tons [1]

[Compiled by Viola May Haslacker]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Algeria	1,081	239	1,015	1,295	1,047	1,222	1,408
Argentina	20,000	18,526	18,100	21,200	21,800	[2] 16,000	[2] 20,000
Australia	192,526	167,385	186,786	199,779	220,437	216,918	222,419
Austria	4,782	947	981	1,971	3,482	4,297	4,440
Belgian Congo	635	715	870	670	400	180	
Bolivia (exports)	9,047	9,508	8,434	11,310	25,610	26,351	(3)
Burma				22	[4] 7,570	[4] 2,318	(3)
Canada	138,155	157,393	160,559	146,662	151,727	144,945	154,119
Newfoundland	26,908	25,319	25,213	21,121			
Chile		54	86	3,507	5,123	2,859	(3)
Czechoslovakia	2,177	1,100	2,200	(3)	(3)	(3)	(3)
Ecuador	485	160	372	226	345	380	200
Finland	237	88	149	182	72	130	(3)
France	4,200	4,852	8,296	7,495	7,645	9,936	11,000
French Equatorial Africa	3,120	3,075	2,807	2,336	2,603	731	1,814
French Morocco	9,293	11,109	11,202	21,200	28,600	36,720	47,429

For footnotes, see end of table.

TABLE 20.—World mine production of lead, by countries, 1944–50, in metric tons [1]—Continued

[Compiled by Viola May Haslacker]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Germany:							
Federal Republic	100,000	15,241	15,378	14,756	22,344	40,944	44,830
Soviet Zone		(3)	(3)	(3)	(3)	(3)	(3)
Greece	520	664	475	936	1,280	2,051	[2] 2,000
Honduras					143	449	352
Hungary			100	200		(3)	300
Italy	3,900	2,300	13,900	24,000	30,400	34,600	[2] 38,000
Japan	17,016	4,932	4,248	5,832	6,693	9,106	10,853
Korea:							
North	13,700	(3)	(3)	(3)	(3)	(3)	(3)
South		2,548		900	300	87	(3)
Mexico	185,282	205,315	140,144	223,133	193,317	220,763	238,078
Nigeria				93	273	(6)	(6)
Northern Rhodesia	1,047	1,748	8,371	15,892	13,229	14,169	13,905
Norway	123	10	26	141	265	320	(3)
Peru	52,501	53,664	44,518	54,814	48,538	65,357	57,356
Poland [4]	15,833	[2] 7,000	10,915	12,761	16,874	17,850	(3)
Rumania	300	3,363	3,224	3,495	(3)	(3)	(3)
Salvador [2]					203	530	530
Southern Rhodesia	300					83	
South-West Africa				12,600	33,600	38,300	34,009
Spain	34,707	25,945	38,662	30,382	29,792	31,550	32,400
Spanish Morocco	69	[5] 224	240	65	215	159	
Sweden	16,151	20,097	21,290	20,858	23,579	23,900	(3)
Tunisia	6,150	6,402	8,655	12,340	13,219	14,860	19,000
Turkey	136				2,756	168	260
Union of South Africa	130	186	152	133	156	166	457
U. S. S. R. [2] [4]	45,000	40,000	48,000	63,000	75,000	90,000	104,000
United Kingdom	3,889	2,731	2,634	2,853	2,312	2,156	3,073
United States	378,168	354,554	304,336	348,558	354,232	371,860	389,974
Yugoslavia	30,500	18,500	43,200	51,600	56,400	72,200	[2] 80,000
Total (estimate)	1,318,000	1,181,000	1,156,000	1,373,000	1,461,000	1,570,000	1,657,000

[1] Lead may be produced in Brazil, China, Cuba, Guatemala, and India, but accurate data on production are not available and no estimates for these countries have been included in the world total.
[2] Estimate.
[3] Data not available, estimate by the author of the chapter included in the total.
[4] Smelter output.
[5] Exports.
[6] Less than 1 ton.

TABLE 21.—World smelter production of lead, by countries where smelted, 1944–50, in metric tons [1]

[Compiled by Viola May Haslacker]

Country	1944	1945	1946	1947	1948	1949	1950
Argentina	19,100	21,159	16,190	17,800	17,830	27,287	[2] 35,000
Australia	157,026	158,353	139,665	161,093	162,057	154,189	164,165
Austria	10,123	1,272	4,476	3,795	9,350	9,841	10,910
Belgium [3]	7,690	7,340	23,762	40,520	66,035	79,304	62,094
Brazil		58	420	402	(4)	1,172	[2] 4,000
Burma					7,570	2,318	
Canada	129,347	147,964	150,360	147,104	145,246	132,608	154,551
China	153	850	14	771	834	2,062	[2] 4,000
Czechoslovakia	(5)	645	2,800	4,460	5,770	(4)	(4)
France	1,923	2,765	32,010	29,218	38,288	54,450	61,236
French Indochina	51						
Germany: [6]							
Federal Republic	[2] 139,900	(4)	[3] 27,659	[3] [7] 24,356	[3] [7] 49,382	[3] 99,372	118,140
Soviet Zone				(4)	(4)	(4)	(4)
Greece	600	700	1,127	948	1,166	1,706	2,125
Guatemala	136	115	131	110	(4)	68	271
Hungary	[8] [9] 3,230	[9] 10	10	60	(4)	(4)	(4)
India				234	554	603	600
Italy	2,229	2,826	14,269	17,701	26,749	28,460	37,469
Japan [10]	32,304	14,580	4,032	6,168	6,972	7,596	9,984
Korea:							
North	21,200	2,548	[2] 2,000	[2] 2,000	(4)	(4)	(4)
South				250			
Mexico	178,270	201,078	137,742	217,827	187,067	212,004	230,831
Northern Rhodesia	1,047	1,748	8,371	15,891	13,229	14,169	13,905

For footnotes, see end of table.

TABLE 21.—World smelter production of lead, by countries where smelted, 1944–50, in metric tons [1]—Continued

[Compiled by Viola May Haslacker]

Country	1944	1945	1946	1947	1948	1949	1950
Norway		52	36	48			
Peru	38,906	40,001	36,478	32,810	34,297	36,027	31,421
Poland	15,833	[2] 7,000	10,915	12,761	16,874	17,850	(4)
Portugal	(4)	(4)	260	321	233	304	591
Rumania	261	3,363	3,225	3,316	(4)	(4)	(4)
South-West Africa				64	82		
Spain	30,978	31,922	32,346	34,382	25,313	33,021	34,876
Sweden	10,553	12,501	11,223	9,229	6,228	10,757	[2] [3] 14,500
Tunisia	5,335	7,023	7,498	9,891	18,060	19,498	23,536
U. S. S. R.[2]	45,000	40,000	48,000	63,000	75,000	90,000	104,000
United Kingdom [3]	3,556	2,743	2,540	2,852	2,312	2,156	3,073
United States (refined) [11]	421,538	402,304	306,717	400,018	363,092	431,695	458,171
Yugoslavia	(4)	10,300	33,100	40,400	49,000	56,800	[2] 69,800
Total (estimate)	1,286,000	1,136,000	1,057,000	1,320,000	1,382,000	1,580,000	1,720,000

[1] Data derived in part from Monthly Bulletin of the United Nations, Statistical Summary of the Mineral Industry (Imperial Institute, London), and the Yearbook of the American Bureau of Metal Statistics.
[2] Estimate.
[3] Includes scrap.
[4] Data not yet available; estimate by author of chapter included in total.
[5] Included with Germany.
[6] Exclusive of secondary material. Includes Upper Silesia and Sudetenland through 1944.
[7] American and British zones only.
[8] January to June, inclusive.
[9] Data represent Trianon Hungary after October 1944.
[10] Revised data excludes scrap.
[11] Figures cover lead refined from domestic and foreign ores; refined lead produced from foreign base bullion not included.

Argentina.—The chief lead-producing district in Argentina is the Aguilar, where the Compania Minera Aguilar, S. A., a subsidiary of the St. Joseph Lead Co., operates the Aguilar group of mines. Throughout 1950 the property was operated at approximately 60 percent of the installed mill capacity owing to continued difficulty in obtaining adequate transportation facilities and to a lack of electric power. During the year a total of 174,398 metric tons of ore was milled, which yielded 23,777 metric tons of lead concentrates. Lead concentrates from the Aguilar mine are smelted at the National Lead Co., S. A., smelter at Barranqueras, Chaco Territory, which also treats lead ores and concentrates imported from Bolivia.

Australia.—The output of lead in Australia increased in 1950 despite local price control on domestic consumption, transportation difficulties, and shortages of steel, skilled labor, and coal.

As in previous years, the famous Broken Hill lode in New South Wales accounted for a substantial portion of Australian lead production. On the northern limb of the lode the North Broken Hill, Ltd., reported a slight increase in the production of ores and concentrates as compared to 1948 and 1949. For the year ended June 30, 1950, ore treated totaled 332,305 tons, from which were recovered 62,600 tons of lead concentrates and 62,239 tons of zinc concentrates. Ore reserves as of June 30, 1950, were estimated at 5,005,000 tons compared with 5,151,000 tons a year earlier. At Broken Hill South, Ltd., on the southern limb of the lode, production totaled 284,962 tons of ore assaying 12.7 percent lead, 12.2 percent zinc, and 7.5 ounces of silver per ton, from which 47,607 tons of lead concentrates containing 73.3 percent lead and 59,708 tons of zinc concentrates were recovered. Ore reserves on June 30, 1950, were reported to be 1,950,000 tons compared with 1,970,000 tons on the same date in 1949. Other companies operating in the Broken Hill area in 1950 included the Zinc Corporation, Ltd., and the New Broken Hill Consolidated, Ltd.

The Electrolytic Zinc Co. of Australasia continued to operate its Rosebery and Hercules mines in the Read-Rosebery district of Tasmania. Despite continued labor shortages in certain skilled categories, output from these two mines for the year ending June 30, 1950, totaled 150,583 tons compared with 126,870 tons for the year ending June 30, 1949. Ore mined was milled in the Rosebery mill and 46,299 tons of zinc concentrates, 9,959 tons of lead concentrates, and 3,889 tons of copper concentrates were recovered. Ore reserves were reported at approximately 1,500,000 tons on June 30, 1950. Zinc concentrates from the Rosebery mill were smelted in the company's Risdon zinc smelter; lead concentrates and copper concentrates continued to be shipped to the United States for treatment.

Burma.—Activity at the Burma Corp., Ltd., Bawdwin mine was limited to maintenance only in 1950, although some ore was extracted during routine repair operations. Resumption of mining and smelting at the property continued to be dependent upon restoration of railroad service between Rangoon and Lashio (railhead for the Bawdwin mine). Another factor in the reopening of the property is the rehabilitation of the Gokteik viaduct between Mandalay and Lashio, which would take about 6 months. Negotiations with the Government of the Union of Burma on the Burma Corp.'s concession on the Bawdwin mines continued throughout the year. Certain provisions of the proposed concession, such as expropriation of the property, terms of compensation, and requirements on the percentage of technical and administrative employees who must be citizens of Burma, were points of disagreement.

Canada.—At Kimberley, British Columbia, the Sullivan mine of the Consolidated Mining & Smelting Co. continued to be the principal source of Canadian lead production. Ore production in 1950 totaled 2,680,962 tons compared with 2,297,672 tons in 1949. The company reports that the grade of ore was lower than in previous years due to more extensive pillar mining and the resulting dilution of ore. New mine installations scheduled for completion in 1951 included the extension of the mine conveyer system to the 2,850-foot level and a coarse crushing plant on that level. Lead concentrates from the Sullivan mine were treated at the company smelter at Trail, B. C., together with ores and concentrates from other mining properties in British Columbia and Yukon. Production of refined pig lead at the smelter totaled 170,364 tons in 1950 compared with 146,176 tons in 1949. The increase was due largely to greater receipts from custom sources, which totaled 206,942 tons in 1950 compared with 134,510 tons in 1949. Production at the smelter was retarded somewhat during the year by the National Railway strike, unusually severe weather in January and February, and by the necessity of operating the old lead smelter during construction of the new one on the same site.[3]

Czechoslovakia.—Lead mining in the vicinity of Przibram continued throughout 1950. Three main shafts were operating at 1,200 to 1,500

[3] Consolidated Mining & Smelting Co., 1950 Annual Report to Stockholders

meters during the year. About 400 to 500 tons of ore, with an average metal content of 2.2 percent lead, 1.1 percent zinc, and 220 grams of silver per ton, was mined per day. Ore from the three shafts is milled in a central flotation plant; concentrated material is shipped to the Przibram lead smelter situated nearby. The smelter, mines, and mill are owned by the Czechoslovakian Government. Yearly production of soft lead from the smelter averages 2,000 to 3,000 tons.[4]

French Morocco.—The Economic Cooperation Administration announced in July an advance of approximately $4,000,000 to the Société des Mines de Zellidja to be used for modernization and expansion of its lead-zinc mine at Bou-Beker in eastern French Morocco near Oujda. The agreement provided for repayment of the loan over a period of 7 years in the form of zinc, and possibly lead, for the United States Government stockpile. It is estimated that the annual output of the company's mine, after the development program is completed, will reach 85,000 tons of lead and 120,000 tons of zinc concentrates. During 1950 the mine produced about 25,000 tons of lead concentrates.

Germany.—The equivalent of nearly $574,000 of Economic Cooperation Administration counterpart funds was received in 1950 by the Stolberger Zinc Mining & Smelting Corp. in Maubach to increase output of lead and zinc. Repayment of the loan will be made through shipments of lead and zinc to the United States stockpile, with deliveries expected to begin in 1951. The Maubach mine is located in the southwest part of Kreis Dueren, Land Nordrheim-Westfalen, on the northern slope of the Eifel Mountains. Average grade of ore is estimated to be 3 percent lead and 2 percent zinc.

Greece.—Economic Cooperation Administration counterpart funds totaling approximately $768,000 were advanced during the year to the Mediterranean Mines, Inc., for development of its Greek Laurium mines approximately 25 miles southeast of Athens. An estimated 300,000 tons of sulfide ore containing a minimum of 5 percent lead, 6 percent zinc, and 2½ ounces of silver to the ton were available for treatment in a flotation mill, which was to be constructed and in operation by the end of 1951. In addition, there were some 2,500,000 tons of tailings containing 2 to 4 percent lead and 1 to 2 ounces of silver which the company planned to re-treat in the mill.

Greenland.—Officials of a Danish Government geological survey party examining lead deposits on the east coast of Mesters Vig in the area around King Oscar Fjord and Davy Sound predicted mining operations would begin in 1951. The deposits, which were discovered in the summer of 1948, are reported to contain at least 1,000,000 tons of lead.

Guatemala.—Lead mining in the Departments of Alta Verapaz and Jalapa continued at about the same level as in 1949. The Caquipec mine owned by Compania Minera do Guatemala, near Coban, Department of Alta Verapaz, was worked throughout the year. Ores assayed about 50 percent lead and for a part of the year were treated in the newly constructed smelter at the mine. Owing to technical difficulties smelting was suspended after a few weeks, and subsequent

[4] Jensen, C. W., Lead Smelting at Przibram: Min. Mag., vol. 83, No. 1, July 1950, pp. 9–11.

production was exported in the form of ore. The ore is hauled 90 miles by truck over rough mountain roads to the town of El Rancho, in the Department of El Progreso, where it is transferred to cars of the International Railways of Central America and shipped to Puerto Barrios on the Atlantic coast.

The Santiago y Mercedes mine near Mataquesquintla, Department of Jalapa, was the only other important lead-producing mine operating in 1950. Most of the output came during the last half of the year. Activities during the first part of 1950 were directed to stope filling and construction of two bypass tunnels around a large fault encountered in the exploratory work.

Mexico.—The increase of activity at Mexican lead and zinc mines during the second half of 1950 was due largely to the impact of the Korean war upon the demand for these metals. According to the annual report to the stockholders of the San Francisco Mines of Mexico, Ltd., ore treated at the company flotation mill during the year totaled a record 623,000 tons, as compared with 580,000 tons in the preceding year. There were 51,119 tons of lead concentrates, 8,396 tons of copper concentrates, and 74,172 tons of zinc concentrates recovered from the ore milled. Ore reserves at the end of September 1950 totaled 4,164,000 tons, assaying 6.5 percent lead, 9 percent zinc, 0.6 percent copper, 0.7 gram of gold, and 155 grams of silver to the ton. This is equivalent to nearly 6 years supply of ore at the present mill capacity of 720,000 tons annually. The company reported an ample supply of labor, but its efficiency is declining.

Northern Rhodesia.—Plans for increasing lead production at Broken Hill were announced by the Rhodesia Broken Hill Development Co. during the year. The deepening of the Davis shaft was started in May 1950, and by the end of the year the shaft had been sunk 1,414 feet. The shaft is being deepened to allow the establishment of a main pumping station at the 1,585-foot level. Excavation and foundation for the new lead-smelter building were commenced during the year. The new plant has been designed to recover lead from the leach residues of the electrolytic zinc process; these residues are not amenable to treatment by the existing smelting equipment and until now have been stockpiled. According to the 1950 annual report to the stockholders, production from the mine during the year ended December 31, 1950, was 13,685 long tons of lead and 22,715 long tons of zinc. A total of 163,441 short dry tons of ore was hoisted during the year as compared with 172,576 tons in 1949. The average grade of ore treated in the concentrator was 19.8 percent lead and 30.8 percent zinc. Proved ore reserves on December 31, 1950, included 1,372,000 short tons of oxide ore and 1,064,000 short tons of sulfide ore.

Tanganyika.—Uruwira Minerals, Ltd., continued in 1950 to develop its lead deposit at Mpanda. Ore mined during development was treated in the company's 100-ton pilot plant. First shipments of lead concentrates were made early in September and were consigned to lead smelters in Antwerp, Belgium. The 131-mile Mpanda branch line of the East African Railways from Kaliua to Mpanda in the western province of Tanganyika, which has been under construction for nearly 3 years, was formally opened for all classes of traffic on August 21, 1950. The line was constructed by the Tanganyika

Government to provide a means of transportation of lead and zinc concentrates from the mine to Dar Es Sallam.

United Kingdom.—Lead consumption in the United Kingdom remained virtually unchanged in 1950 as compared to 1949. Over-all consumption, including pig lead recovered from scrap, in 1950 was 328,123 tons (328,539 in 1949), of which 26 percent was used in cable covering; 24 percent in sheet and pipe; 17 percent in white lead and oxides, excluding battery oxide; 16 percent in batteries; and 17 percent for miscellaneous purposes.

Stocks of refined lead in the United Kingdom on December 31, 1950, totaled 61,687 long tons compared with 51,399 tons on December 31, 1949.

Lead and Zinc Pigments and Zinc Salts

By Helena M. Meyer and Alethea W. Mitchell

GENERAL SUMMARY

SHIPMENTS of lead and zinc pigments and zinc salts rebounded in 1950 from the reduced rates that accompanied the industrial recession of mid-1949. All classes covered by this report were shipped in substantially greater quantities in 1950 than in 1949, particularly after the outbreak of hostilities in Korea in June; lead pigments rose more sharply than the zinc group.

In the second half of 1950 the following gains over the first half were noted in shipments of various products: White lead (dry and in oil) 46 percent, litharge 44 percent, red lead 40 percent, zinc oxide (lead-free) 15 percent, and leaded zinc oxide 33 percent. For all of 1950 as compared with 1949, lead-pigment gains ranged from 65 percent for white lead (dry and in oil) to 41 percent for red lead. Zinc-pigment increases ranged from 74 percent for leaded zinc oxide to 35 percent for lithopone. Zinc chloride gained 17 percent and zinc sulfate 19 percent.

Industries that are large users of pigments showed marked advances in 1950. Passenger automobile production rose 30 percent over 1949 to a new all-time high; trucks gained 17 percent to a peak lower only than the record in 1948; the value of sales of paint, lacquer, and varnish materials was 20 percent greater than in 1949 and 7 percent more than the previous peak in 1948; the value of private construction gained 27 percent and public construction 11 percent; consumption of natural rubber rose 24 percent and synthetic, 28 percent as compared with 1949. Of these, the paint and construction gains, being stated in value terms, reflect in part the rising price level.

Lead and zinc, chief raw materials of the pigments industry, were available in greater quantities in 1950 than in 1949; but demand for these metals increased at a higher rate than supplies, so that pigment manufacturers could not fill total raw material needs. The price of common lead at New York was 12 cents a pound when the year began and in the first quarter continued the downtrend of the last quarter of 1949. After dropping to the lowest quotation of the year—10.50 cents a pound in March—there was some fluctuation, followed in the latter part of the year by a rise to 17 cents. The price for Prime Western slab zinc at East St. Louis dropped ⅛ cent a pound in early January 1950, and thereafter every price change was upward, culminating in a peak price of 17.50 cents a pound September 7 and for the remainder of the year.

Lead- and zinc-pigment prices generally followed the pattern set by the constituent primary metals. Lead-pigment prices dropped in the first half of the year and after July advanced without interruption to the year's highest levels at the year end, or to 4 to nearly 7 cents a pound above opening prices. Zinc-pigment price changes were upward from the beginning to the end of the year. Advances of about 5 cents a pound for most zinc classes were proportionately greater than lead-pigment changes and carried prices of zinc pigments to heights never previously attained. Lead-pigment prices were at all-time highs in 1948 and early 1949.

The supply-demand situation in zinc led to a National Production Authority Order, M–15, effective December 1, which restricted nonpriority use of zinc metal and zinc metal products in 1951 to an average quarterly rate of 80 percent of that during the first 6 months of 1950. Rated orders and mandatory NPA directives were not included in the foregoing limitation. Inventories were restricted to a 45-day supply or to a "practicable minimum working inventory," whichever was less. Under NPA Order M–9, effective November 16, 1950, producers of zinc, zinc oxide, and other zinc products were not required to accept rated orders for shipment in one month exceeding 10 percent of production.

Shipments of white lead (dry) increased 81 percent, the largest gain of the products covered by this report. The "in oil" variety rose 43

TABLE 1.—Salient statistics of the lead and zinc pigments industry of the United States, 1941–45 (average) and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Production (shipments)[1] of principal pigments:						
White lead (dry and in oil)......short tons..	81,940	[2] 66,501	68,787	46,070	27,355	45,176
Red lead........do....	51,388	32,526	36,064	30,787	24,866	35,072
Litharge.........do....	120,777	133,799	167,050	154,775	121,052	177,658
Zinc oxide.......do....	132,108	157,851	160,771	150,958	110,132	160,829
Leaded zinc oxide short tons..	57,574	67,971	81,459	67,441	36,722	63,973
Lithopone.......do....	145,750	147,001	165,024	140,033	78,335	105,650
Value of products:						
All lead pigments......	$42,702,000	$43,595,000	[3] $90,199,000	[3] $90,915,000	[3] $58,564,000	[3] $79,858,000
All zinc pigments......	36,437,000	44,195,000	63,891,000	65,547,000	43,152,000	71,322,000
Total...............	79,139,000	87,790,000	[3] 154,090,000	[3] 156,462,000	[3] 101,716,000	[3] 151,180,000
Value per ton received by producers:						
White lead (dry).......	$157	[2] [4] $179	$308	$363	$351	$335
Red lead...............	167	196	333	396	333	314
Litharge...............	146	175	313	387	324	292
Zinc oxide.............	135	144	186	218	230	258
Leaded zinc oxide......	128	143	204	245	242	262
Lithopone..............	77	81	105	115	115	124
Foreign trade:						
Lead pigments:						
Value of exports...	$1,288,000	$851,000	$1,041,000	$970,000	$1,157,000	$950,000
Value of imports...	7,000	13,000	150,000	633,000	143,000	344,000
Zinc pigments:						
Value of exports...	2,660,000	2,911,000	6,554,000	5,229,000	3,426,000	2,124,000
Value of imports...	7,000	9,000	31,000	7,000	52,000	1,275,000
Export balance..	3,934,000	3,740,000	7,414,000	5,559,000	4,388,000	1,455,000

[1] Reported as sales before 1945.
[2] Data for basic lead sulfate in 1946 included under white lead; Bureau of Mines not at liberty to show separately.
[3] Excludes value of basic lead sulfate; Bureau of Mines not at liberty to publish.
[4] Corrected figure.

percent, litharge was 47 percent higher, and red lead gained 41 percent. Both classes of white lead in 1949 had been shipped at, by far, the lowest levels since considerably before the beginning of the present century. The greater tonnage for litharge in 1950 established a new high record for shipments of this product. Red-lead shipments, though substantially above 1949, were far below World War II years and also below those in the latter half of the 1920's.

Zinc oxide (lead-free) shipments were 46 percent over those in 1949 and equaled the previous record established in 1928 and duplicated in 1929 and 1947. The leaded variety rose 74 percent in 1950 but was little more than three-quarters of the peak in 1947. Lithopone increased 35 percent over 1949 but was well below all years from 1924–48, inclusive.

The zinc chloride and zinc sulfate gains of 17 and 19 percent, respectively, were small compared with those for the foregoing pigments. Both compounds, however, showed to advantage with the more distant past, that is, zinc sulfate shipments were lower only than in the record year 1946, and zinc chloride shipments probably fell below only the three earlier years 1920, 1947, and 1948.

Increases in shipments of pigments to ceramics manufacturers were greater on the whole than to the larger consumers. Shipments

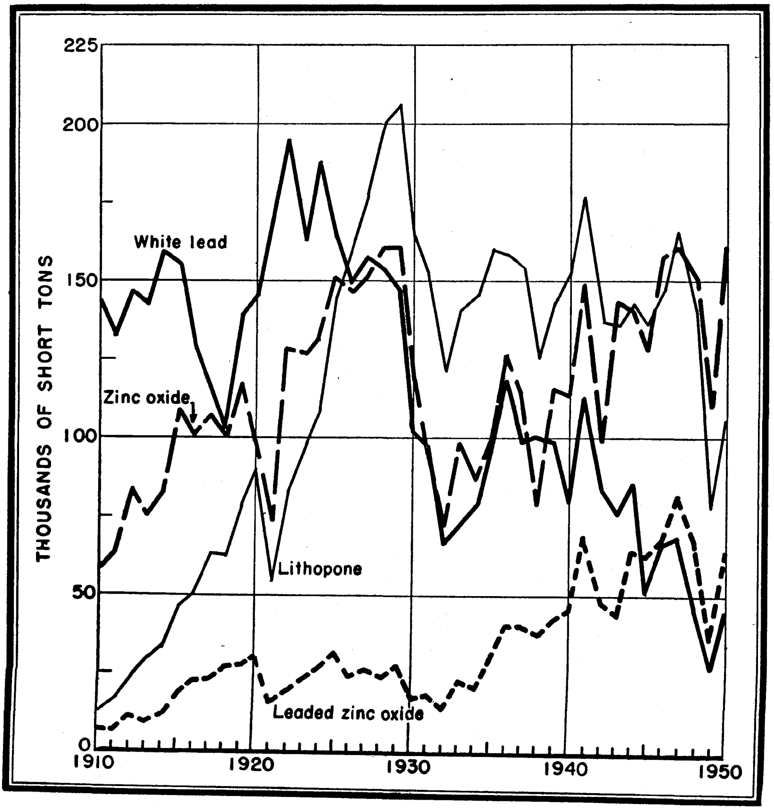

FIGURE 1.—Trends in shipments of white pigments, 1910–50.

of both litharge and white lead to this group increased more than 100 percent over the preceding year, while shipments of both litharge and zinc oxide were greater than ever before. Gains in distribution to paint makers of the pigments covered by this report ranged from 39 percent for lithopone to 75 percent for leaded zinc oxide. These increases were substantially more than the rise in total value of paint, varnish, and lacquer materials sold, a discrepancy that would appear even greater if the comparison were with physical volume.

Zinc oxide shipments to makers of rubber returned to the high levels of 1946–48 but increased less than the zinc oxide class as a whole. Litharge and lithopone shipments for rubber manufacture contrasted with each other in gaining 118 and 26 percent, respectively. The use of litharge for storage battery manufacture lagged behind the over-all performance of this pigment and consumption of red lead for this purpose fell short of the customary 50 percent or more of total red-lead shipments.

Double the 1949 quantity of litharge went into the manufacture of insecticides in 1950, and zinc sulfate shipments for agricultural use gained 32 percent. The quantities of both commodities sold for this purpose, however, were substantially below highs for recent years. Lithopone sales to makers of floor coverings and paper declined 17 and 4 percent, respectively, contrasting with almost every other item in this report.

Termination of the Mexican Trade Agreement at the end of December had no effect on the products covered by this report other than zinc sulfate. The tariff on zinc sulfate was restored to ¾ cent a pound from ½ cent under the Mexican Treaty.

Demand for the competitive titanium pigments was not satisfied in 1950 despite the fact that production and shipments of the titanium pigments established new record highs, 18 and 21 percent, respectively, above previous peaks in 1948. Except for 1949, titanium pigments have been establishing new records in each successive year. Pigment-plant capacity and not raw-material shortages limited production and prevented even greater increases in 1950 than actually occurred. At present, the Bureau of Mines is not at liberty to publish figures covering pigments of this class.

PRODUCTION

The value of lead and zinc pigments in 1950 (exclusive of that for basic lead sulfate, which cannot be shown) was $151,180,000, a 49-percent increase over 1949 compared with a 48-percent gain in tonnage. Lead pigments and zinc pigments comprised 53 and 47 percent, respectively, of the total value in 1950 and 58 and 42 in 1949.

For many years, figures on *sales* were used in this series of reports as a better guide than production to activity in the pigments industry. Beginning with 1945, the base was changed to shipments to conform with data compiled on Bureau of Mines lead and zinc schedules. Available information for 1945 (the year of change) indicated little difference between sales and shipments in that year. In reporting tonnages of pigments, an attempt is made to avoid all duplication, one of the chief problems being that finished pigments frequently are blended to make another product. Basic lead sulfate and zinc oxide, for example, are blended to make leaded zinc oxide, and in this instance the pigment weights appear in the total for the last-named class only. Pigments consumed by producing companies to make products beyond those covered by this report—that is, paints, storage batteries, and other articles—are considered as shipments.

LEAD PIGMENTS

Shipments of lead pigments rose 49 percent in quantity and 36 percent in value in 1950 compared with 1949. Average values of all items dropped in 1950, so that the greater total value is explained entirely by the substantial gains in tonnages shipped. Shipments of white lead (dry and in oil) increased 65 percent, of litharge 47 percent, and of red lead 41 percent. (Shipments of basic lead sulfate are excluded from the foregoing totals.)

Quoted prices for lead pigments dipped in the first half of 1950 and after July followed a continuous upward course, closing at the highest levels of the year. Average values reported by producers declined as follows: White lead (dry) 5 percent, white lead in oil 6 percent, red lead 6 percent, and litharge 10 percent.

White Lead.—Shipments of white lead rebounded in 1950 from the low levels of 1949, which were the lowest by far since much before the beginning of the present century; 1950 shipments were 65 percent

TABLE 2.—Production and shipments of lead pigments [1] in the United States, 1949–50

Pigment	1949				1950			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value [2]			Short tons	Value [2]	
			Total	Average			Total	Average
White lead:								
Dry	15,609	15,719	$5,520,250	$351	27,954	28,506	$9,553,687	$335
In oil [3]	11,187	11,636	5,504,207	473	16,778	16,670	7,403,032	444
Red lead	26,362	24,866	8,276,801	333	34,066	35,072	11,013,908	314
Litharge	123,157	121,052	39,262,768	324	178,225	177,658	51,887,453	292

[1] Except for basic lead sulfate, figure for which Bureau of Mines is not at liberty to publish.
[2] At plant, exclusive of container.
[3] Weight of white lead only, but value of paste.

TABLE 3.—Lead pigments shipped by manufacturers in the United States, 1941–45 (average) and 1946–50, in short tons

Year	White lead			Basic lead sulfate or sublimed lead		Red lead	Orange mineral	Litharge
	Dry	In oil	Total	White	Blue			
1941–45 (average)	40,785	41,155	81,940	5,642	1,279	51,388	193	120,777
1946	[1] 41,892	24,609	66,501	(1)	(1)	32,526	123	133,799
1947	39,075	29,712	68,787	(2)	(2)	36,064		167,050
1948	26,551	19,519	46,070	(2)	(2)	30,787		154,775
1949	15,719	11,636	27,355	(2)	(2)	24,866		121,052
1950	28,506	16,670	45,176	(2)	(2)	35,072		177,658

[1] Basic lead sulfate included with white lead (dry); Bureau of Mines not at liberty to publish figure.
[2] Bureau of Mines not at liberty to publish figure.

higher than those in 1949 but otherwise were smaller than at any time since some years prior to 1900.

Basic Lead Sulfate.—The Bureau of Mines is not at liberty to publish figures on basic lead sulfate for 1946–50.

Red Lead.—Red-lead shipments rose 41 percent in 1950 but were far below World War II years and those in the latter half of the 1920's.

Orange Mineral.—No shipments of orange mineral were reported in 1947–50.

Litharge.—A new high record was established by shipments of litharge in 1950, which were 47 percent greater than in 1949 and 6 percent over the previous top in 1947. The peak automobile production rate, with its consequent large demand for storage batteries, was an important factor in the establishment of record litharge shipments.

Battery manufacturers produced 80,000 tons of black or suboxide of lead for their own use in place of litharge. This quantity was 45 percent over 1949 and 16 percent above the earlier peaks in 1948 and 1947. Black oxide production required 77,000 tons of pig lead in 1950 and 53,000 tons in 1949.

ZINC PIGMENTS AND SALTS

Shipments of zinc pigments rose 47 percent in quantity and 65 percent in value in 1950 over 1949. Unlike the lead group, all zinc-pigment average values gained; price quotations were believed to have established all-time peaks during the year. The total value of zinc pigments shipped likewise was higher than ever before. All price changes in zinc pigments were upward during 1950, the highest quotations of the year being those in effect at the year end.

Percentage increases in zinc-pigment shipments ranged from 35 percent for lithopone to 74 percent for leaded zinc oxide. Average values received by producers rose as follows: Zinc oxide (lead-free) 12 percent, leaded zinc oxide 8 percent, and lithopone 8 percent.

Shipments of zinc chloride and zinc sulfate gained 17 and 19 percent, respectively. The tonnage for zinc sulfate was second only to the record established in 1946, and the quantity of zinc chloride was 6 percent below 1948, believed to be the record year thus far, and

TABLE 4.—Production and shipments of zinc pigments and salts in the United States, 1949–50

Pigment or salt	1949				1950			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value [1]			Short tons	Value [1]	
			Total	Average			Total	Average
Zinc oxide [2]	109,126	110,132	$25,299,970	$230	161,374	160,829	$41,439,269	$258
Leaded zinc oxide [2]	37,046	36,722	8,874,695	242	63,194	63,973	16,752,888	262
Lithopone	72,233	78,335	8,977,178	115	98,321	105,650	13,129,363	124
Zinc chloride, 50° B	55,197	55,208	3,857,386	70	63,843	64,564	4,703,250	73
Zinc sulfate	20,952	20,065	2,365,120	118	23,587	23,912	3,124,413	131

[1] Value at plant, exclusive of container.
[2] Zinc oxide containing 5 percent or more lead is classed as leaded zinc oxide. In this table data for leaded zinc oxide include a small quantity containing less than 5 percent lead.

TABLE 5.—Zinc pigments and salts shipped [1] by manufacturers in the United States, 1941–45 (average) and 1946–50, in short tons

Year	Zinc oxide	Leaded zinc oxide	Lithopone	Zinc chloride (50° B.)	Zinc sulfate
1941–45 (average)	132,108	57,574	145,750	[2] 54,964	17,438
1946	157,851	67,971	147,001	57,316	24,931
1947	160,771	81,459	165,024	65,521	21,547
1948	150,958	67,441	140,033	68,701	21,513
1949	110,132	36,722	78,335	55,208	20,065
1950	160,829	63,973	105,650	64,564	23,912

[1] Reported as sales before 1945.
[2] 1942–45, inclusive; data for 1941 not available.

otherwise only slightly less than in one or two other high years. Average values of the two compounds increased 4 and 11 percent, respectively.

Zinc Oxide.—Zinc oxide (lead-free) shipments were 46 percent above 1949 and equaled the previous peak established in 1928 and duplicated in 1929 and 1947. The acceleration of defense mobilization after June threatened to reduce supplies of zinc metal and scrap to zinc oxide manufacturers and thus to curtail the availability of this pigment.

TABLE 6.—Production of zinc oxide (lead-free) by processes, 1945–50, as percent of total

Process	1945	1946	1947	1948	1949	1950
American process (ore and primary residues)	77	75	73	76	71	72
French process (metal and scrap)	15	17	17	15	17	18
Other	8	8	10	9	12	10
Total	100	100	100	100	100	100

Leaded Zinc Oxide.—Shipments of leaded zinc oxide rose 74 percent in 1950, a gain, among the products covered by this report, second only to white lead (dry). These shipments, however, were far from a record, reaching little more than three-fourths of the all-time peak of 1947.

Production of leaded zinc oxide, by grades (comparison with 1949 in parentheses) was as follows: 54,641 (31,434) tons of 35 percent lead and under and 8,553 (5,612) tons of over 35 percent lead.

Lithopone.—Lithopone shipments increased 35 percent over 1949 but fell well below all years from 1924–48, inclusive. Plant capacity for the manufacture of lithopone was reported to be 155,000 tons in 1950 compared with 157,000 in 1949.

The lithopone statistics in this report are given on the basis of ordinary lithopone sold as such plus the ordinary lithopone content of the high-strength product. This method of publication is used to conceal the operations of one company that always dominates the output of the high-strength product and has been the only producer in some years. In 1950, as in 1947–49, this company operated two plants producing high-strength lithopone.

Consumption of ordinary lithopone in the manufacture of titanated lithopone has dropped to very small proportions. The trend has been downward almost continuously since the peak—19,400 tons—was reached in 1937. In 1950 the tonnage increased 71 percent, the first gain since 1940, but the larger quantity was only 15 percent of the 1937 total. The lithopone figures in table 7 are included in the totals for ordinary lithopone in other tables.

TABLE 7.—Titanated lithopone produced in the United States and ordinary lithopone used in its manufacture, 1941–45 (average) and 1946–50, in short tons

Year	Titanated lithopone produced	Ordinary lithopone used	Year	Titanated lithopone produced	Ordinary lithopone used
1941–45 (average)	11,460	9,700	1948	2,100	1,700
1946	7,500	6,350	1949	2,000	1,700
1947	2,600	2,200	1950	3,400	2,900

Zinc Sulfide.—In 1950, as in several preceding years, only one company produced zinc sulfide; the Bureau of Mines is not at liberty to publish figures for this pigment.

Zinc Chloride.—Shipments of zinc chloride (50° B. solution) rose 17 percent in 1950, the smallest increase shown for the products covered by this report. The 1950 tonnage is believed to be smaller only than those for 1920, 1947, and 1948.

Zinc Sulfate.—A 19-percent increase in shipments of zinc sulfate resulted in the second-highest total on record for this compound; 1950 shipments were only 4 percent under the peak established in 1946.

RAW MATERIALS USED

Figures covering the raw materials used in making pigments and salts in 1950 and 1949 are shown in the accompanying tables.

Lead pigments and zinc pigments and salts are manufactured from a variety of materials, including ore, refined metal, and such secondary materials as scrap. In 1950, as in 1949, roughly 94 percent of the lead in pigments was derived from pig lead and the remainder from ore. Of the lead in ore used to make leaded zinc oxide, about 14 (6 in 1949) percent was from foreign sources. The proportion for zinc pigments was 73 (72) percent from ore and concentrates, 9 (8) percent from slab zinc, and 17 (20) percent from secondary materials; about 22 (18) percent of the ore used was foreign.

Tables 8 and 9 give the source of the metal used in manufacturing each pigment and salt. Pig lead is employed exclusively, either directly or indirectly, in manufacturing white lead, litharge, red lead, and orange mineral and is used also in manufacturing basic lead sulfate. The lead content of leaded zinc oxide made from basic lead sulfate, which in turn is made from pig lead, is credited to pig lead in the table. Zinc oxide is the only pigment in which considerable slab zinc is used. Ore is employed in manufacturing zinc oxide, leaded zinc oxide, lithopone, zinc sulfide, zinc sulfate, and basic lead sulfate. A substantial proportion of the zinc in lithopone (59 percent in 1950 and 65 in 1949) and most of that in zinc chloride (all in 1950 and 1949) made in the United States are derived from secondary material. For a number of years before the United States entered World War II, there had been a large increase in the quantity of secondary zinc used in manufacturing zinc oxide. The scarcity of supplies of both metal and scrap caused the proportion of the total oxide made by the French process—which uses only metal and scrap—to drop sharply in 1942 and to continue comparatively low in 1943–46, despite the fact that the total percentage from metal and scrap rose in 1943 and continued upward almost without interruption in 1944–50. The production of zinc oxide from metal and scrap accounted for the following percentages in relation to total production: 41 percent in 1939, 16 percent in 1942, 19 percent in 1943, 22 percent in 1944, 25 percent in 1945, 26 percent in 1946, 28 percent in 1947, 26 percent in 1948, 29 percent in 1949 and 29 percent in 1950.

TABLE 8.—Lead content of lead and zinc pigments [1] produced by domestic manufacturers, by sources, 1949–50, in short tons

Pigment	1949: Lead in pigments produced from—: Ore: Domestic	1949: Ore: Foreign	1949: Pig lead	1949: Total lead in pigments	1950: Lead in pigments produced from—: Ore: Domestic	1950: Ore: Foreign	1950: Pig lead	1950: Total lead in pigments
White lead			21,504	21,504			35,897	35,897
Red lead			23,900	23,900			30,884	30,884
Litharge			114,314	114,314			165,428	165,428
Leaded zinc oxide	8,835	555		9,390	12,606	2,061		14,667
Total	8,835	555	159,718	169,108	12,606	2,061	232,209	246,876

[1] Excludes lead in basic lead sulfate, data for which Bureau of Mines not at liberty to publish.

TABLE 9.—Zinc content of zinc pigments [1] and salts produced by domestic manufacturers, by sources, 1949–50, in short tons

Pigment or salt	1949: Zinc in pigments and salts produced from—: Ore: Domestic	1949: Ore: Foreign	1949: Slab zinc	1949: Secondary material [2]	1949: Total zinc in pigments and salts	1950: Zinc in pigments and salts produced from—: Ore: Domestic	1950: Ore: Foreign	1950: Slab zinc	1950: Secondary material [2]	1950: Total zinc in pigments and salts
Zinc oxide	48,715	13,534	10,171	14,676	87,096	69,412	22,327	16,866	19,749	128,354
Leaded zinc oxide	17,747	1,183			18,930	26,946	5,274			32,220
Lithopone	4,159	723	9	9,118	14,009	6,380	1,507	30	11,494	19,411
Total pigments	70,621	15,440	10,180	23,794	120,035	102,738	29,108	16,896	31,243	179,985
Zinc chloride				12,157	12,157				14,346	14,346
Zinc sulfate	2,003	78		4,464	6,545	2,127	461		4,710	7,298

[1] Excludes zinc sulfide, data for which Bureau of Mines not at liberty to publish.
[2] These figures are higher than those shown in the report on Secondary Metals—Nonferrous because they include zinc recovered from byproduct sludges, residues, etc., not classified as purchased scrap material.

CONSUMPTION AND USES

LEAD PIGMENTS

White Lead.—As usual white-lead shipments were preponderantly to the paint industry, although the customary 90 percent or more was not indicated in the statistics for 1950. Doubtless, this situation was due to the inability of shippers to give complete data on end-use classification. It is known that some white lead sold to the Government was reported under "Other", and it is likely that a substantial part of the entire "Other" classification belongs properly under paint. Shipments to ceramics manufacturers, after declining since 1947, doubled in 1950 compared with 1949 and slightly exceeded the high level of 1941–45.

TABLE 10.—Distribution of white lead (dry and in oil) shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946 [2]	1947	1948	1949	1950
Paints	74,062	60,943	61,265	40,892	[3] 24,284	38,920
Ceramics	1,749	1,367	1,665	1,369	894	1,815
Other	6,129	4,191	5,857	3,809	[3] 2,177	[4] 4,441
Total	81,940	66,501	68,787	46,070	27,355	45,176

[1] Reported as sales before 1945.
[2] Data for basic lead sulfate included with white lead; Bureau of Mines not at liberty to show former separately.
[3] Revised figure.
[4] Of which 1,257 tons were for plasticizers and stabilizers.

Basic Lead Sulfate.—A distribution of basic lead sulfate shipments by uses has not been available for publication since 1945, when 3,009 short tons went to the paint industry, 200 tons to the rubber industry, and 686 tons to other industries. Substantial quantities of lead sulfate are also used as an intermediate product in manufacturing leaded zinc oxide. Such quantities have always been shown in this chapter under leaded zinc oxide rather than basic lead sulfate.

Red Lead.—Shipments to storage-battery manufacturers again were greater than to any other class, but this use failed to account for more than 50 percent of the total in 1950 as against 52 percent in 1941–45 and 59 percent in 1946. The paint industry took 40 percent of the total in 1950 compared with 29 percent in 1946 and 38 percent in 1941–45. Shipments to ceramics makers were similar to the tonnages for most recent years except 1946 and 1948.

TABLE 11.—Distribution of red-lead shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946	1947	1948	1949	1950
Storage batteries	26,900	19,115	20,883	14,854	12,163	17,478
Paints	19,586	9,318	11,362	10,863	9,634	14,103
Ceramics	932	1,228	977	1,275	603	981
Other	3,970	2,865	2,842	3,795	2,466	2,510
Total	51,388	32,526	36,064	30,787	24,866	35,072

[1] Reported as sales before 1945.

Orange Mineral.—No shipments of orange mineral have been reported since 1946, when 78 short tons went to the ink industry, 18 tons to the color-pigment industry, and 27 tons to other industries.

Litharge.—Shipments of litharge to ceramics makers were higher by 39 percent than the previous peak in 1948. This use took 16 percent of the total in 1950, compared with 10 percent in 1941–45 and a range of 10 to 13 percent in 1946 to 1949. Only storage batteries rank above ceramics in consumption of litharge, and these took nearly four times as much as the latter in 1950. The 1950 tonnage for batteries was only 6 percent under the all-time high, in 1947, and except for that year was a record. Insecticide makers doubled their use of litharge in 1950, but this industry took much less than half of its 1944 peak quantity. Chrome-pigment tonnages were comparable to the best totals of the recent past, as were those shipped to rubber manufacturers and, except for 1 or 2 years, to oil refineries. Shipments to the varnish industry were only slightly under the 1948 high.

TABLE 12.—Distribution of litharge shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946	1947	1948	1949	1950
Storage batteries	60,157	75,836	111,840	100,645	77,163	105,558
Ceramics	12,314	13,166	18,360	19,979	13,299	27,771
Insecticides	19,697	14,259	7,288	6,033	5,353	10,651
Chrome pigments	10,050	10,877	9,228	7,455	8,557	10,017
Oil refining	5,755	6,682	7,688	7,248	5,720	6,488
Varnish	3,156	3,302	4,258	4,424	4,286	4,347
Rubber	3,323	2,131	2,205	2,835	1,398	3,047
Floor coverings	264	106	141	152	62	220
Other	6,061	7,440	6,042	6,004	5,214	9,559
Total	120,777	133,799	167,050	154,775	121,052	177,658

[1] Reported as sales before 1945.

ZINC PIGMENTS AND SALTS

Zinc Oxide.—More than half of the 1950 tonnage of the lead-free class was for the manufacture of rubber, and the quantity so used was close to the largest ever consumed for this purpose. Paint manufacture stood second as an end use of zinc oxide in 1950, taking quantities smaller only than in 2 or 3 years from 1925 to 1930. A new top was established in the use of zinc oxide in ceramics, the previous

TABLE 13.—Distribution of zinc oxide shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946	1947	1948	1949	1950
Rubber	66,802	83,776	82,248	82,895	58,496	82,944
Paints	27,658	34,785	32,867	26,779	26,205	39,699
Ceramics	4,694	9,056	11,350	12,327	6,982	12,679
Coated fabrics and textiles[2]	8,118 (coated fabrics and textiles and floor coverings)	10,022	9,100	9,474	5,200	6,303
Floor coverings		2,848	4,735	4,938	2,665	3,670
Chemical warfare	10,308					
Other	14,528	17,364	20,471	14,545	10,584	15,534
Total	132,108	157,851	160,771	150,958	110,132	160,829

[1] Reported as sales before 1945.
[2] Includes the following tonnages for rayon: 1946—9,363; 1947—7,302; 1948—8,209; 1949—4,470; 1950—4,850.

high for 1948 being exceeded slightly. This use has made outstanding gains over a short period, the quantity for 1950 being 170 percent greater than the average for 1941–45. Despite substantial gains in shipments for coated fabrics and textiles and for floor coverings, these uses lagged well behind the level of some other recent years.

Leaded Zinc Oxide.—Leaded zinc oxide is used almost exclusively in manufacturing paint, and 98 percent of the shipments in 1950 were reported to be for this purpose. The tonnage for paint in 1950 was 20 percent below the 1947 peak and slightly smaller than in 1948 and 1946. The fact that leaded zinc oxide is made from ores rather than from metal or scrap improves the competitive position of this pigment for paint manufacture in times of metal and scrap scarcity such as existed during World War II and following the outbreak of war in Korea in June 1950.

TABLE 14.—Distribution of leaded zinc oxide shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946	1947	1948	1949	1950
Paints	55, 581	64, 816	77, 994	64, 912	35, 938	63, 002
Rubber	72	166	131	218	124	240
Other	1, 921	2, 989	3, 334	2, 311	660	731
Total	57, 574	67, 971	81, 459	67, 441	36, 722	63, 973

[1] Reported as sales before 1945.

Lithopone.—Paints, varnish, and lacquers regularly take around three-fourths of the total lithopone shipped, and the 74 percent for 1950 compares with 72 percent in 1949, 75 in 1948, and 82 in 1947. Textiles, second-largest use, consumed 20 percent more lithopone in 1950 than in 1949. Rubber used 26 percent more lithopone than in 1949 and made a good showing in relation to earlier years as well. Shipments to manufacturers of floor coverings and paper dropped 17 and 4 percent, respectively, in contrast to almost every other item covered by this report. Both classes of users took only about half of the average annual quantities for 1941–45.

Zinc Chloride.—Statistics on the end-use distribution of zinc chloride shipments are not available.

TABLE 15.—Distribution of lithopone shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946	1947	1948	1949	1950
Paint, varnish, and lacquers [2]	112, 793	123, 279	134, 830	104, 441	56, 146	78, 177
Coated fabrics and textiles	5, 141	7, 626	8, 421	8, 436	6, 602	7, 945
Floor coverings	11, 550	7, 541	9, 048	12, 423	6, 380	5, 297
Rubber	1, 475	1, 607	3, 086	4, 192	3, 245	4, 092
Paper	4, 520	3, 011	4, 069	4, 814	2, 375	2, 290
Printing ink	(3)	(3)	(3)	(3)	(3)	838
Other	10, 271	3, 937	5, 571	5, 727	3, 587	7, 011
Total	145, 750	147, 001	165, 024	140, 033	78, 335	105, 650

[1] Reported as sales before 1945.
[2] Includes a small quantity, not separable, used for printing ink, except in 1950.
[3] Included in "Other" before 1950, except for those quantities reported under "Paint, varnish, and lacquers."

Zinc Sulfate.—Rayon has ranked first in consumption of zinc sulfate continuously since 1946, when the agricultural use led, and in 1950 took a larger quantity than ever before, exceeding the previous peak in 1949 by 6 percent. Agriculture continued to rank second in 1950 but took a tonnage 46 percent less than in 1946 and only 52 percent of the 1950 quantity for rayon. Chemicals, in third place, have dropped in apparent importance over the years but this may be due to the fact that they overlap other uses and that producers' reports for recent years have been classified more precisely. Among other uses, the most significant detail appears to be the sharp falling off in shipments for paint and varnish processing. This use had gained in 1949 when most others declined.

TABLE 16.—Distribution of zinc sulfate shipments,[1] by industries, 1941–45 (average) and 1946–50, in short tons

Industry	1941–45 (average)	1946		1947		1948		1949		1950	
	Gross weight	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis
Rayon	5,108	7,634	5,883	8,210	6,173	9,900	7,333	10,591	7,957	11,217	8,322
Agriculture	4,422	10,816	8,178	7,827	6,125	5,210	4,248	4,429	3,595	5,841	4,880
Chemicals	2,774	2,254	1,488	2,120	1,439	1,734	1,193	1,197	851	1,879	1,377
Flotation reagents	862	1,084	643	1,112	717	1,632	1,366	921	757	952	727
Glue	628	511	335	624	444	561	462	453	370	579	464
Electrogalvanizing	288	488	315	233	146	319	205	217	154	324	203
Paint and varnish processing	1,539	174	151	61	51	121	104	663	585	189	119
Textile dyeing and printing	187	552	491	60	38	102	66	30	21	145	129
Other	1,630	1,418	943	1,300	864	1,934	1,191	1,564	979	2,786	1,820
Total	17,438	24,931	18,427	21,547	15,997	21,513	16,168	20,065	15,269	23,912	18,041

[1] Reported as sales before 1945.

PRICES

Total and average values received by producers for lead and zinc pigments and zinc salts are given in the tables in the first part of this report. Average values for all lead pigments dropped in 1950, the declines ranging from 5 percent for white lead (dry) to 10 percent for litharge. This was the second annual decrease, following establishment of successive peaks for all types in 1947 and 1948. Lead-pigment price quotations followed closely the movement of pig-lead prices. The pigment quotations dropped ¾ to 1½ cents a pound, depending on the pigment, in the first half of the year, and after July followed a continuous upward course so that they were 4 to nearly 7 cents a pound higher at the end than at the beginning of the year. Both high and low extremes in lead-pigment price quotations in 1950 were below the respective highs and lows in 1949.

Average values received by producers for zinc pigments, unlike those for the lead group, were higher than in 1949, with rises varying from 8 percent for lithopone and leaded zinc oxide to 12 percent for zinc oxide (lead-free). Producers' average values and zinc-pigment quotations are believed to have established new all-time peaks. Zinc-pigment prices moved upward from the beginning to the end of

TABLE 17.—Range of quotations on lead pigments and zinc pigments and salts at New York (or delivered in the East), 1947–50, in cents per pound

[Oil, Paint and Drug Reporter]

Product	1947	1948	1949	1950
White lead (basic lead carbonate), dry, carlots, barrels	13.75–16.00	[1] 16.00–22.10	[1] 14.75–22.10	[1] 14.00–18.50
Basic lead sulfate (sublimed lead), less than carlots, barrels	13.25–15.75	15.75–21.25	14.25–21.25	13.25–18.75
Red lead, dry, 95 percent or less, less than carlots, barrels	15.75–18.60	18.00–25.25	15.75–25.25	14.25–20.75
Orange mineral, American, small lots, barrels	17.75–21.00	20.50–27.60	18.10–27.60	16.60–23.10
Litharge, commercial, powdered, barrels	13.75–17.60	16.60–24.25	13.75–24.25	13.25–19.75
Zinc oxide:				
American process, lead free, bags, carlots	9.00–10.00	10.00–13.50	10.00–15.50	11.00–16.00
American process, 5 to 35 percent lead, barrels, carlots	9.25–12.00	10.25–15.38	10.25–17.38	11.25–16.88
French process, red seal, bags, carlots	10.25–11.25	11.25–14.75	11.50–16.75	12.25–17.25
French process, green seal, bags, carlots	10.75–11.75	11.75–15.25	11.75–17.25	12.75–17.75
French process, white seal, barrels, carlots	11.50–12.50	12.50–16.00	12.50–18.00	13.50–18.50
Lithopone, ordinary, small lots, bags	5.25– 6.25	6.25– 6.75	6.50– 6.75	6.50– 8.50
Zinc sulfide, less than carlots, bags, barrels	10.00–11.00	10.75–14.00	12.50–14.00	13.50–25.00
Zinc chloride, works:				
Solution, tanks	2.50– 3.00	3.00– 3.25	3.25	3.25– 4.10
Fused, drums	5.00– 7.40	6.25– 7.90	6.75– 8.15	7.00– 9.85
Zinc sulfate, crystals,[2] barrels	3.65– 5.00	4.55– 6.85	4.95– 6.85	4.95–10.15

[1] Quotations for bags.
[2] Includes granulated.

the year, most of the varieties increasing about 5 cents a pound. Lithopone gains were about 2 cents a pound.

Average values received by producers for zinc chloride and zinc sulfate rose 4 and 11 percent, respectively, in 1950. Price quotations for these compounds also rose in 1950 and were at their highest levels of the year at the year end.

FOREIGN TRADE [1]

Imports of lead and zinc pigments are insignificant in relation to domestic shipments of the various items, receipts of white lead carbonate, the chief lead entry, amounting to 2 percent of domestic shipments in 1950 and of zinc oxide, the chief zinc item, to only 3 percent. Even this latter was unusually high, being due to the sharp gain in imports of zinc oxide in 1950. Of the total imports of this material, 2,875 tons were from Canada, 732 from Spain, 585 from Germany, and 529 from the United Kingdom. Lithopone imports also rose sharply in 1950.

Litharge is the chief lead-pigment export class, but shipments of this pigment abroad were only 1 percent of shipments by domestic producers.

Lithopone and zinc oxide are the chief zinc-pigment export classes; both of these classes dropped substantially in 1950.

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 18.—Value of foreign trade of the United States in lead and zinc pigments and salts, 1948–50

[U. S. Department of Commerce]

	Imports for consumption			Exports		
	1948	1949	1950	1948	1949	1950
Lead pigments:						
White lead	$82,538	$73,485	$271,035	$294,527	$276,888	$243,344
Red lead	96,506	11,848	27,114	390,222	[1] 408,491	[1] 194,939
Litharge	421,595	39,822	4,570	285,473	471,143	511,942
Other lead pigments	32,689	17,448	40,781	(2)	(2)	(2)
Total	633,328	142,603	343,500	(2)	(2)	(2)
Zinc pigments:						
Zinc oxide	7,361	49,809	1,081,816	2,256,050	1,507,205	875,829
Zinc sulfide	----------	----------	14,479	(2)	(2)	(2)
Lithopone	----------	2,053	179,197	2,972,912	1,918,913	1,248,538
Total	7,361	51,862	1,275,492	5,228,962	3,426,118	2,124,367
Lead and zinc salts:						
Lead arsenate	----------	----------	----------	433,779	186,991	216,034
Other lead compounds	448	4	1,055	(2)	(2)	(2)
Zinc chloride	----------	2,650	30,447	(2)	(2)	(2)
Zinc sulfate	10,397	6,472	11,202	(2)	(2)	(2)
Total	10,845	9,126	42,704	(2)	(2)	(2)
Grand total	651,534	203,591	1,661,696	(2)	(2)	(2)

[1] Data not strictly comparable to earlier years.
[2] Data not available.

TABLE 19.—Lead pigments and salts imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Short tons							Total value
	White lead (basic carbonate)	Red lead	Litharge	Lead suboxide	Lead pigments n. s. p. f.	Lead arsenate	Other lead compounds	
1946	1	54	15	11	(1)	(1)	----------	$13,038
1947	1	22	416	33	----------	60	----------	171,060
1948	203	247	1,064	34	30	----------	1	633,776
1949	161	23	96	23	6	----------	(1)	142,607
1950	944	70	12	57	27	----------	2	344,555

[1] Less than 0.5 ton.

TABLE 20.—Zinc pigments and salts imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Short tons						Total value
	Zinc oxide		Lithopone	Zinc sulfide	Zinc chloride	Zinc sulfate	
	Dry	In oil					
1946	41		(1)	(1)	2	415	$26,528
1947	117	1	(1)			295	47,482
1948	27	(1)				180	17,758
1949	239	(1)	12		17	120	60,984
1950	5,093	2	1,201	33	210	159	1,317,141

[1] Less than 0.5 ton.

TABLE 21.—Lead pigments and salts exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Short tons				Total value
	White lead	Red lead	Litharge	Lead arsenate	
1946	910	1,355	2,180	1,398	$1,184,872
1947	863	787	1,212	1,552	1,632,143
1948	663	953	644	1,019	1,404,001
1949	699	1,042	1,357	430	1,343,513
1950	815	549	1,612	520	1,166,259

TABLE 22.—Zinc pigments and salts exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons		Total value [1]	Year	Short tons		Total value [1]
	Zinc oxide	Lithopone			Zinc oxide	Lithopone	
1945	7,102	11,576	$2,554,177	1948	8,642	21,015	$5,228,962
1946	10,955	9,651	2,911,457	1949	5,040	14,460	3,426,118
1947	19,082	13,652	6,554,250	1950	3,094	9,357	2,124,367

[1] Includes also in 1945: Zinc sulfide, $25,399 (173,475 pounds); zinc chloride, $93,590 (1,499,755 pounds); zinc sulfate, $62,119 (1,243,826 pounds); other zinc salts and compounds, $179,747 (750,108 pounds). Beginning Jan. 1, 1946, none of the foregoing classes separately recorded.

WORLD REVIEW

Australia.—The plant of Durham Chemicals Australia Pty., Ltd., at Braybrook, Victoria, for the production of zinc oxide and later other pigments for the rubber, paint, and plastic industries, which was mentioned in the report of this series for 1947, was completed recently.[2]

Canada.—A report of the Dominion Bureau of Statistics of Canada published early in 1951 gave data on pigments consumed by the paint and varnish industry in Canada in 1948 and 1949. The figures for 1949 are as follows (1948 figures for comparison in parentheses):

[2] Chemical Engineering, vol. 58, No. 2, February 1951, p. 230.

Basic carbonate white lead (dry) 1,303 (2,344) short tons, basic carbonate white lead in oil 458 (717) tons, basic sulfate white lead 118 (22) tons, red lead (including orange mineral) 565 (691) tons, litharge 256 (300) tons, zinc oxide (lead-free) 2,013 (2,975) tons, leaded zinc oxide 1,071 (2,096) tons, lithopone (30 percent zinc sulfide) 5,767 (11,851) tons, titanium dioxide 5,894 (5,766) tons, extended titanium dioxide pigments 10,832 (8,791) tons, and "other white pigments" 705 (529) tons.

Canada's imports of lithopone, 8,141 and 14,787 tons, respectively, in 1949 and 1948, were large enough to more than cover use in the 2 years. Imports of zinc white (zinc oxide) were 1,094 and 1,732 tons, respectively. Imports of the other items listed in the preceding paragraph are very small except for titanium pigments. Imports of this item were not shown separately in the Canadian report, but United States records for titanium dioxide and pigments show 19,653 tons exported to Canada in 1949 and 19,787 tons in 1948. In 1950 the United States shipped 24,450 tons to Canada.

Greece.—Output of litharge was 398 tons and of red lead, 267 tons in 1950, or declines of 9 and 26 percent, respectively, from 1949.[3]

Italy.—According to a recent report,[4] about 5,000 metric tons of Italy's output of lithopone is absorbed by the domestic market, and the remainder is exported. Exports in 1949 were 2,000 tons, with Austria and Australia the chief destinations. Annual production capacity is 15,000 to 17,000 tons.[5]

Japan.—A recent article [6] described the paint industry in Japan and commented on the strong influence of United States practice in Japan. The report stated:

> In pigments, our attention is especially drawn to your Rutile-non-chalking titanium dioxide and Acicular zinc oxide. In oil, our attention is drawn to the process in applying drying properties by uniting non-saturated molecules to semidrying oil, and the products obtained therefrom such as styrenated oil, and the derivation of drying oil from semidrying oil and the product itself. In synthetic resin, we are interested in silico-resin, vinyl-resin, maleic-acid resin, and others such as anti-skinning agent, wetting agent, and emulsifier.

Norway.—Norway was reported [7] facing inadequate supplies of zinc oxide, owing to efforts of the Ministry of Commerce to increase exports of high-grade zinc. According to the report, Norway's three zinc-oxide manufacturers have a total capacity of over 7,000 tons of zinc oxide annually and produced 5,210 metric tons in 1949. Imports in 1949 were 1,774 tons. From January 1 to October 1, 1950, only about 3,300 tons of zinc oxide were produced, and imports were only 70 tons. Industrial requirements were estimated as 6,500 to 7,000 tons annually, mostly for paint manufacture.

---

[3] Foreign Commerce Weekly, vol. 43, No. 1, Apr. 2, 1951, p. 31.
[4] Foreign Commerce Weekly, vol. 39, No. 13, June 26, 1950, p. 31.
[5] Foreign Commerce Weekly, vol. 39, No. 10, June 5, 1950, p. 37.
[6] Matsumoto, Toku, Report From Japan: Paint Ind. Mag., vol. 65, No. 11, November 1950, pp. 212-214.
[7] U. S. Embassy, Painters and Paint Manufacturers Face Zinc Oxide Shortage: Despatch 1013, Jan. 4, 1951, Oslo, Norway.

Lime[1]

By Oliver Bowles, F. M. Barsigian, and A. H. Seebold

GENERAL SUMMARY

THE HIGH level of industrial activity stimulated by the program of national preparedness and by the Korean War during the latter half of the year was reflected in a substantial increase in lime production in 1950. Sales totaled 7,478,416 short tons, 18 percent higher than in 1949 and 3 percent greater than the record output of 1948. Of the total sales, 75 percent was in the form of quicklime and 25 percent hydrated lime. The average value of quicklime per ton increased from \$10.48 in 1949 to \$10.57 in 1950. Hydrated-lime value increased from \$12.31 in 1949 to \$12.80 in 1950. The number of active plants declined from 180 to 168.

TABLE 1.—Salient statistics of the open-market lime industry in the United States 1925–29 (average), 1935–39 (average), and 1949–50

	1925–29 (average)	1935–39 (average)	1949	1950
Active plants	419	310	180	168
Sold by producers:				
By types:				
Quicklime ... short tons	2,871,236	2,488,269	4,624,356	5,593,315
Hydrated ... do	1,585,631	1,204,128	1,693,946	1,885,101
Total lime:				
Short tons	4,456,867	3,692,397	6,318,302	7,478,416
Value[1]	\$38,548,498	\$26,592,115	\$69,319,374	\$83,247,990
Per ton	\$8.65	\$7.20	\$10.97	\$11.13
By uses:				
Agricultural ... short tons	318,224	350,535	328,528	332,687
Building ... do	2,096,744	870,335	1,052,097	1,248,989
Chemical and industrial ... do	1,623,885	1,929,947	3,618,969	4,137,297
Refractory (dead-burned dolomite) ... do	418,014	541,580	1,318,708	1,759,443
Imports for consumption ... do	16,683	14,108	34,332	34,284
Exports ... do	15,752	10,905	59,927	50,491

[1] Selling value, f. o. b. plant, excluding cost of containers.

Lime sales are influenced more or less by conditions in the consuming industries. Sales of building lime should presumably follow the trend of new building construction, and for many years such correlation was reasonably close. However, since 1939, as indicated in figure 1, the output of building lime has failed to keep pace with the indicated level of new construction. Throughout the 26-year period covered by figure 1, sales of refractory and chemical lime have followed closely the trend of industrial production.

Trends in lime sales by principal uses over a period of years are indicated in figure 2.

[1] Figures in this chapter pertain chiefly to open-market lime, excluding coverage of most captive lime operations.

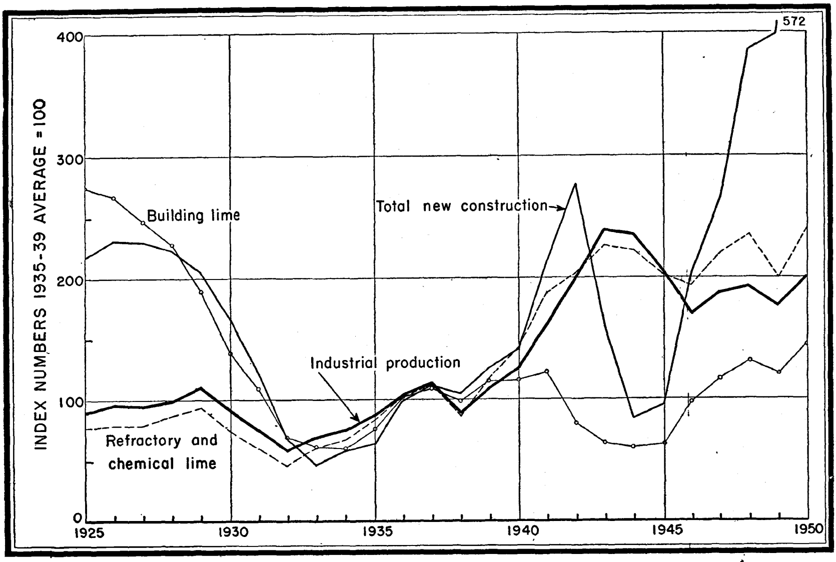

FIGURE 1.—Sales of building lime compared with total new construction and sales of refractory and chemical lime compared with industrial production, 1925–50. Units are reduced to percentages of the 1935–39 average. Statistics on value of construction from the Bureau of Foreign and Domestic Commerce (Survey of Current Business, March 1951) and on industrial production from the Federal Reserve Board.

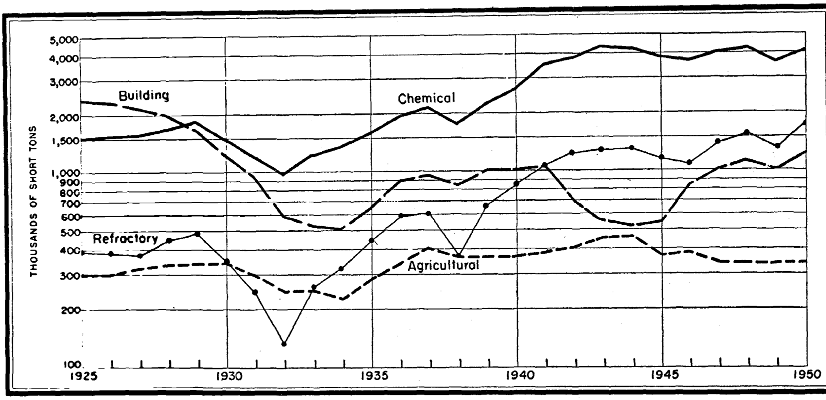

FIGURE 2.—Trends in major uses of lime, 1925–50.

DOMESTIC PRODUCTION

Total production of open-market lime (as indicated by sales) increased 18 percent in quantity and 20 percent in value from 1949 to 1950. The major gains were in refractory lime (dead-burned dolomite), 33 percent, and in building lime, 19 percent. Chemical and industrial lime sales gained 14 percent. As lime stocks are relatively small and constant the quantities sold or used as recorded herein are virtually equivalent to production.

Captive Tonnage.—The statistics included in this chapter pertain primarily to open-market lime, but in some instances relatively small quantities of captive tonnage are included where it is particularly desirable to show complete figures for consumption by use. Specifically, in the figures for lime sold or used in the United States in 1950, there was included a total of 456,191 short tons of captive tonnage, distributed as follows: 47,723 tons for building, 294,521 tons for metallurgical uses, 74,493 tons for miscellaneous chemical uses, and 39,454 tons of refractory lime (dead-burned dolomite). A more complete figure for total lime production can be obtained by adding to the total given herein the quantity calculated from the limestone tonnages (shown in the chapter on Stone in this volume) consumed in the uses in which limestone is generally calcined.

TABLE 2.—Lime sold by producers in the United States, 1949–50, by types and major uses

	1949				1950					
	Quantity		Value [1]		Quantity		Value [1]		Percent change from 1949 in—	
	Short tons	Percent of total	Total	Average	Short tons	Percent of total	Total	Average	Tonnage	Average value
By types:										
Quicklime	4,624,356	73	$48,464,831	$10.48	5,593,315	75	$59,126,427	$10.57	+21	+1
Hydrated lime	1,693,946	27	20,854,543	12.31	1,885,101	25	24,121,563	12.80	+11	+4
Total lime [2]	6,318,302	100	69,319,374	10.97	7,478,416	100	83,247,990	11.13	+18	+1
By uses:										
Agricultural:										
Quicklime	111,813	2	1,063,125	9.51	103,823	1	1,037,222	9.99	−7	+5
Hydrated lime	216,715	3	2,481,195	11.45	228,864	3	2,567,149	11.22	+6	−2
Total	328,528	5	3,544,320	10.79	332,687	4	3,604,371	10.83	+1	(3)
Building:										
Quicklime	223,533	4	2,849,582	12.75	281,924	4	3,585,189	12.72	+26	(3)
Hydrated lime	828,564	13	10,794,161	13.03	967,065	13	13,296,618	13.75	+17	+6
Total	1,052,097	17	13,643,743	12.97	1,248,989	17	16,881,807	13.52	+19	+4
Chemical and Industrial:										
Quicklime	2,970,302	47	28,621,898	9.64	3,448,125	46	32,778,456	9.51	+16	−1
Hydrated lime	648,667	10	7,579,187	11.68	689,172	9	8,257,796	11.98	+6	+3
Total	3,618,969	57	36,201,085	10.00	4,137,297	55	41,036,252	9.92	+14	−1
Refractory (dead-burned dolomite)	1,318,708	21	15,930,226	12.08	1,759,443	24	21,725,560	12.35	+33	+2

[1] Selling value, f. o. b. plant, excluding cost of container.
[2] Includes lime used by producers (captive tonnage) as follows—1949: 355,367 tons, $3,171,392; 1950: 456,191 tons, $3,977,905.
[3] Less than ±0.5 percent.

Size of Plants.—The trend toward fewer and larger plants that has characterized recent years was strikingly evident during 1950. Although the total number of plants reporting declined by 12, the number of plants producing 100,000 tons a year or more increased from 15 to 21. These 21 plants produced 56 percent of the total lime tonnage. The 43 plants having individual production rates greater than 50,000 tons a year contributed 76 percent of the total compared with 71 percent in 1949 for 38 plants in this size group.

TABLE 3.—Distribution of open-market lime (including refractory) plants, 1948–50, according to size of production

Size group (short tons)	1948			1949			1950		
	Plants	Production		Plants	Production		Plants	Production	
		Short tons	Percent of total		Short tons	Percent of total		Short tons	Percent of total
Less than 1,000	23	7,816	(1)	21	6,991	(1)	17	6,199	(1)
1,000 to less than 5,000	33	84,142	1	38	106,799	2	29	77,098	1
5,000 to less than 10,000	21	148,212	2	21	147,016	2	19	136,637	2
10,000 to less than 25,000	35	598,777	8	33	523,073	8	30	480,555	6
25,000 to less than 50,000	23	856,772	12	29	1,060,247	17	30	1,143,169	15
50,000 to less than 100,000	26	1,685,117	23	23	1,637,382	26	22	1,473,928	20
100,000 and over	20	3,883,140	54	15	2,836,794	45	21	4,160,830	56
Total	181	7,263,976	100	180	6,318,302	100	168	7,478,416	100

[1] Less than 0.5 percent.

PRODUCTION BY STATES

In 1950 open-market lime was produced in 32 States and 2 Territories. As in 1949, Ohio was far in the lead as the chief producer, followed by Pennsylvania and Missouri. These three States together contributed 57 percent of the United States output.

TABLE 4.—Lime (quick and hydrated) sold by producers in the United States, 1949–50, by States

State or Territory	1949			1950		
	Active plants	Short tons	Value	Active plants	Short tons	Value
Alabama	8	359,446	$3,203,564	7	389,071	$3,577,850
Arizona	4	43,529	607,709	4	51,530	717,885
Arkansas	1	(1)	(1)	1	(1)	(1)
California	7	153,483	2,516,262	6	171,440	2,722,835
Colorado	1	(1)	(1)			
Connecticut	1	(1)	(1)	1	(1)	(1)
Florida	2	(1)	(1)	2	(1)	(1)
Georgia	1	7,028	67,252	1	11,998	121,556
Hawaii	1	8,404	226,926	1	8,141	219,861
Illinois	6	276,161	3,197,890	6	367,485	4,465,413
Indiana	1	(1)	(1)	1	(1)	(1)
Maine	2	(1)	(1)	1	(1)	(1)
Maryland	8	64,299	617,696	8	64,687	691,843
Massachusetts	3	107,931	1,360,328	3	139,357	1,830,625
Michigan	3	(1)	(1)	3	(1)	(1)
Minnesota	1	(1)	(1)	1	(1)	(1)
Missouri	8	878,561	8,035,117	7	1,035,176	9,447,669
Montana	2	(1)	(1)	2	(1)	(1)
Nevada	3	(1)	(1)	3	(1)	(1)
New Jersey	3	(1)	(1)	3	(1)	(1)
New York	2	(1)	(1)	2	(1)	(1)
Ohio	18	1,712,248	20,321,387	18	2,142,344	26,273,098
Oklahoma	1	(1)	(1)	1	(1)	(1)
Oregon				2	(1)	(1)
Pennsylvania	34	911,065	10,190,679	30	1,086,451	12,663,074
Puerto Rico	5	7,347	184,618	4	8,166	180,828
South Dakota	1	(1)	(1)	1	(1)	(1)
Tennessee	6	117,053	1,108,139	5	98,232	958,325
Texas	8	173,724	1,739,185	9	216,439	2,074,367
Utah	5	36,082	355,516	4	49,419	456,471
Vermont	3	28,914	356,381	3	32,843	415,910
Virginia	13	349,132	3,213,897	11	428,339	3,861,932
Washington	2	(1)	(1)	2	(1)	(1)
West Virginia	6	350,311	3,535,352	5	(1)	(1)
Wisconsin	10	107,339	1,254,751	10	124,530	1,448,095
Undistributed [1]		626,245	7,226,725		1,052,768	11,120,353
Total	180	6,318,302	69,319,374	168	7,478,416	83,247,990

[1] Figures that may not be shown separately are combined as "Undistributed."

Hydrated Lime.—About three-fourths of the lime sold is in the form of quicklime and the balance as hydrated lime. In 1950, 25 percent of the total lime output was in hydrated form compared with 27 percent in 1949.

TABLE 5.—Hydrated lime sold by producers in the United States, 1949–50, by States

State or Territory	1949			1950		
	Active plants	Short tons	Value	Active plants	Short tons	Value
Alabama	4	40,663	$505,707	4	43,490	$553,203
California	6	30,447	470,840	5	31,191	476,319
Georgia	1	7,028	67,252	1	11,998	121,556
Hawaii	1	8,403	226,881	1	8,138	219,726
Illinois	3	34,729	398,739	3	35,753	430,429
Maryland	5	22,763	223,915	4	20,724	224,724
Massachusetts	3	45,207	604,434	3	59,782	810,830
Missouri	6	154,626	1,663,665	6	181,448	1,911,574
Ohio	14	635,545	7,919,770	14	729,826	9,771,646
Pennsylvania	12	289,814	3,632,698	13	321,634	4,172,983
Tennessee	6	40,551	408,377	5	28,599	337,594
Texas	6	52,457	633,299	5	53,171	622,438
Vermont	1	5,625	71,656	1	8,569	128,535
Virginia	11	58,763	649,857	9	73,856	836,864
West Virginia	4	30,532	273,220	3	19,448	203,402
Other States [1]	33	236,793	3,104,233	32	257,474	3,299,740
Total	116	1,693,946	20,854,543	109	1,885,101	24,121,563

[1] Includes the following States and number of plants in 1950 (1949 same as 1950, unless shown differently in parentheses): Arizona 2, Arkansas 1, Colorado 0 (1), Connecticut 1, Florida 1, Indiana 1, Maine 1 (2), Michigan 1, Minnesota 1, Montana 1, Nevada 2 (1), New Jersey 3, New York 2, Oklahoma 1, Oregon 2 (0), Puerto Rico 3 (4), Utah 2 (3), Washington 1, and Wisconsin 6.

CONSUMPTION AND USES

Table 6, showing sales of lime by States and uses, provides geographic data that may be of interest. Although many figures are concealed to avoid revealing confidential information, the table shows, in general, the more important uses to which the lime of each State is applied and the relative importance of each State as a lime producer.

Table 7, on sales of lime according to use, indicates the great variety of uses to which lime is applied and its importance in agriculture, building construction, and industry in general. The chemical and industrial uses of lime have attained great importance during recent years; in 1950, 55 percent of the total output was applied to such uses. In that year 14 percent more lime was assigned to these categories than in 1949, but there was considerable fluctuation in the relative quantities applied to individual uses. Of the principal uses shown in table 7, the quantities employed in calcium carbide manufacture, insecticides, sewage and trade-waste treatment, and sugar refining were virtually unchanged from 1949. Reflecting the high level of metal production, metallurgical lime increased 25 percent and refractory lime 33 percent over 1949. Lime for glass works increased 23 percent, for paper manufacture 7 percent, and for water purification 14 percent. A small increase was recorded for agricultural lime, and the quantity of lime applied to building uses advanced 19 percent.

The sales distribution of hydrated lime by use is indicated in table 8.

TABLE 6.—Lime sold by producers in the United States in 1950, by States and uses

State or Territory	Agricultural		Building		Chemical and industrial										Refractory		Total	
					Metallurgical		Paper mills		Tanneries		Water purification		Other					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	(1)	(1)	79, 261	$814, 712	186, 226	$1, 480, 816	56, 451	$541, 328	(1)	(1)	19, 484	$207, 927	(1)	(1)	(1)	(1)	389, 071	$3, 577, 850
Arizona	32	$800	5, 423	95, 113	36, 674	421, 827	-----	-----	(1)	(1)	(1)	(1)	8, 361	$182, 395	-----	-----	51, 530	717, 885
Arkansas	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
California	(1)	(1)	51, 173	940, 148	23, 364	366, 543	(1)	(1)	(1)	(1)	6, 493	84, 539	33, 443	441, 233	(1)	(1)	171, 440	2, 722, 835
Connecticut	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	-----	-----	-----	-----	(1)	(1)	-----	-----	(1)	(1)
Florida	(1)	(1)	(1)	(1)	-----	-----	-----	-----	-----	-----	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Georgia	1, 528	8, 172	10, 470	113, 384	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11, 998	121, 556
Hawaii	-----	-----	881	23, 841	-----	-----	-----	-----	-----	-----	-----	-----	7, 260	196, 020	-----	-----	8, 141	219, 861
Illinois	-----	-----	10, 238	116, 365	95, 669	1, 075, 745	(1)	(1)	(1)	(1)	38, 359	450, 142	19, 530	237, 389	(1)	(1)	367, 485	4, 465, 413
Indiana	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Maine	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	-----	-----	-----	-----	-----	-----	-----	-----	(1)	(1)
Maryland	55, 706	599, 951	8, 981	91, 892	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	64, 687	691, 843
Massachusetts	6, 674	86, 366	46, 781	659, 305	(1)	(1)	20, 067	242, 908	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	139, 357	1, 830, 625
Michigan	-----	-----	-----	-----	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Minnesota	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Missouri	(1)	(1)	84, 858	886, 943	193, 587	1, 618, 530	(1)	(1)	(1)	(1)	(1)	(1)	384, 211	3, 348, 434	(1)	(1)	1, 035, 176	9, 447, 669
Montana	-----	-----	(1)	(1)	(1)	(1)	-----	-----	-----	-----	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Nevada	-----	-----	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
New Jersey	(1)	(1)	(1)	(1)	-----	-----	-----	-----	-----	-----	(1)	(1)	-----	-----	-----	-----	(1)	(1)
New York	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Ohio	51, 904	595, 105	632, 632	8, 678, 435	77, 904	712, 581	29, 687	291, 606	(1)	(1)	(1)	(1)	(1)	(1)	1, 067, 237	$13, 123, 122	2, 142, 344	26, 273, 098
Oklahoma	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
Oregon	(1)	(1)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(1)	(1)
Pennsylvania	135, 182	1, 530, 991	134, 052	1, 944, 178	269, 777	3, 001, 711	99, 008	1, 033, 774	32, 165	$336, 502	52, 644	601, 709	(1)	(1)	166, 461	2, 076, 974	1, 086, 451	12, 663, 074
Puerto Rico	(1)	(1)	(1)	(1)	-----	-----	-----	-----	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	8, 166	180, 828
South Dakota	-----	-----	-----	-----	(1)	(1)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	(1)	(1)
Tennessee	107	906	8, 573	100, 590	16, 315	155, 558	40, 073	363, 904	1, 978	20, 465	8, 057	93, 547	23, 129	223, 355	-----	-----	98, 232	958, 325
Texas	250	2, 337	38, 144	419, 023	(1)	(1)	12, 299	106, 094	(1)	(1)	48, 801	484, 253	(1)	(1)	-----	-----	216, 439	2, 074, 367
Utah	-----	-----	1, 111	19, 960	46, 514	402, 048	-----	-----	-----	-----	(1)	(1)	(1)	(1)	-----	-----	49, 419	456, 471
Vermont	2, 695	40, 425	897	13, 306	430	6, 237	27, 797	340, 582	214	3, 210	82	1, 230	728	10, 920	-----	-----	32, 843	415, 910
Virginia	21, 878	273, 411	7, 258	86, 125	71, 582	657, 465	66, 965	537, 073	5, 239	42, 704	(1)	(1)	(1)	(1)	-----	-----	428, 339	3, 861, 932
Washington	-----	-----	(1)	(1)	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)	(1)	(1)	-----	-----	(1)	(1)
West Virginia	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Wisconsin	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	8, 862	151, 379	-----	-----	124, 530	1, 448, 095
Undistributed[1]	56, 731	465, 907	128, 256	1, 878, 487	363, 045	3, 611, 566	265, 609	2, 875, 625	43, 556	522, 798	392, 807	3, 699, 062	1, 002, 851	9, 853, 518	525, 745	6, 525, 464	1, 052, 768	11, 120, 353
Total	332, 687	3, 604, 371	1,248,989	16,881,807	1, 381, 087	13, 510, 627	617, 956	6, 332, 894	83, 152	925, 679	566, 727	5, 622, 409	1, 488, 375	14, 644, 643	1, 759, 443	21, 725, 560	7, 478, 416	83, 247, 990

[1] Figures that may not be shown separately are combined as "Undistributed."

TABLE 7.—Lime (quick and hydrated) sold by producers in the United States, 1949–50, by uses

Use	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Agricultural	328, 528	$3, 544, 320	$10. 79	332, 687	$3, 604, 371	$10. 83
Building:						
Finishing lime	502, 013	6, 800, 540	13. 55	614, 349	8, 825, 406	14. 37
Mason's lime	423, 033	5, 463, 439	12. 91	462, 220	6, 227, 144	13. 47
Prepared masonry mortars	56, 791	588, 435	10. 36	100, 323	1, 034, 101	10. 31
Unspecified	70, 260	791, 329	11. 26	72, 097	795, 156	11. 03
Total	1, 052, 097	13, 643, 743	12. 97	1, 248, 989	16, 881, 807	13. 52
Chemical and industrial:						
Alkalies (ammonium, potassium, and sodium compounds)	1, 728	20, 928	12. 11	(1)	(1)	(1)
Asphalts and other bitumens	180	2, 445	13. 58	1, 639	20, 363	12. 42
Bleach, liquid and powder [2]	7, 063	81, 549	11. 55	6, 770	81, 863	12. 09
Brick, sand-lime and slag	19, 369	223, 247	11. 53	28, 297	329, 676	11. 65
Brick, silica (refractory)	12, 942	153, 594	11. 87	15, 126	191, 070	12. 63
Calcium carbide and cyanamide	480, 141	4, 023, 613	8. 38	480, 891	4, 053, 972	8. 43
Calcium carbonate (precipitated)	22, 458	199, 161	8. 87	24, 208	246, 030	10. 16
Coke and gas (gas purification and plant byproducts)	24, 697	254, 638	10. 31	26, 642	273, 490	10. 27
Explosives	(1)	(1)	(1)	2, 693	30, 753	11. 42
Food Products:						
Creameries and dairies	737	13, 486	18. 30	823	12, 729	15. 47
Gelatin	5, 790	68, 154	11. 77	6, 409	72, 524	11. 32
Stock feed	26, 818	300, 976	11. 22	19, 933	212, 493	10. 66
Other [3]	1, 894	25, 009	13. 20	1, 972	24, 702	12. 53
Glassworks	171, 132	1, 715, 181	10. 02	210, 273	2, 106, 404	10. 02
Glue	7, 922	83, 199	10. 50	9, 279	97, 635	10. 52
Grease, lubricating	3, 195	32, 940	10. 31	4, 804	64, 808	13. 49
Insecticides, fungicides, and disinfectants	79, 608	920, 555	11. 56	80, 051	974, 192	12. 17
Medicines and drugs	10, 407	97, 256	9. 35	13, 671	132, 170	9. 67
Metallurgy:						
Nonferrous smelter flux	1, 391	20, 317	14. 61	3, 428	53, 069	15. 48
Steel (open-hearth and electric furnace flux)	878, 189	8, 490, 669	9. 67	1, 132, 073	11, 038, 896	9. 75
Ore concentration [4]	183, 862	1, 747, 779	9. 51	211, 993	2, 010, 627	9. 48
Wire drawing	17, 700	216, 694	12. 24	19, 637	247, 859	12. 62
Other [5]	27, 032	327, 788	12. 13	13, 956	160, 176	11. 48
Paints	17, 903	208, 519	11. 65	26, 472	306, 902	11. 59
Paper mills	575, 507	5, 889, 359	10. 23	617, 956	6, 332, 894	10. 25
Petroleum refining	46, 620	500, 256	10. 73	43, 535	475, 138	10. 91
Rubber manufacture	715	7, 967	11. 14	908	11, 455	12. 62
Salt refining	7, 492	68, 905	9. 20	9, 382	82, 455	8. 79
Sewage and trade-wastes treatment	91, 879	1, 007, 634	10. 97	91, 244	1, 052, 356	11. 53
Soap and fat	3, 184	31, 964	10. 04	1, 743	17, 637	10. 12
Sugar refining	35, 456	529, 169	14. 92	35, 366	513, 779	14. 53
Tanneries	75, 052	822, 110	10. 95	83, 152	925, 679	11. 13
Varnish	329	5, 046	15. 34	366	6, 266	17. 12
Water purification	498, 217	5, 119, 362	10. 28	566, 727	5, 622, 409	9. 92
Wood distillation	4, 787	49, 250	10. 29	6, 484	67, 313	10. 38
Undistributed [6]	87, 071	951, 201	10. 92	112, 977	1, 169, 970	10. 36
Unspecified	190, 502	1, 991, 165	10. 45	226, 417	2, 016, 498	8. 91
Total	3, 618, 969	36, 201, 085	10. 00	4, 137, 297	41, 036, 252	9. 92
Refractory lime (dead-burned dolomite)	1, 318, 708	15, 930, 226	12. 08	1, 759, 443	21, 725, 560	12. 35
Grand total lime [7]	6, 318, 302	69, 319, 374	10. 97	7, 478, 416	83, 247, 990	11. 13
Hydrated lime included in above distribution	1, 693, 946	20, 854, 543	12. 31	1, 885, 101	24, 121, 563	12. 80

[1] Included with "Undistributed," to avoid disclosure of individual operations.
[2] Bleach used in paper mills excluded from "Bleach" and included with "Paper mills."
[3] Includes citrates, tartrates, and miscellaneous food products.
[4] Includes flotation, cyanidation, bauxite purification, and magnesium manufacture.
[5] Includes barium and vanadium processing, cupola, gold recovery, and unspecified metallurgical uses.
[6] Includes alcohol, alkalies (1950 only), explosives (1949 only), oil drilling, petrochemicals (glycol), plastics, polishing compounds, retarder, sulfur, tobacco, and miscellaneous industrial uses.
[7] Includes lime used by producers (captive tonnage) as follows—1949: 355,367 tons, valued at $3,171,392 1950: 456,191 tons, $3,977,905.

TABLE 8.—Hydrated lime sold by producers in the United States, 1949–50, by uses

Use	1949 Short tons	1949 Value Total	1949 Value Average	1950 Short tons	1950 Value Total	1950 Value Average
Agricultural	216,715	$2,481,195	$11.45	228,864	$2,567,149	$11.22
Building	828,564	10,794,161	13.03	967,065	13,296,618	13.75
Chemical and industrial:						
Bleach, liquid and powder	3,132	36,378	11.61	1,064	13,087	12.30
Brick, sand-lime and slag	4,907	62,354	12.71	8,316	103,234	12.41
Brick, silica	11,412	138,476	12.13	12,514	164,734	13.16
Coke and gas	1,135	12,896	11.36	904	10,380	11.48
Food products	12,993	157,914	12.15	16,859	201,860	11.97
Insecticides, fungicides, and disinfectants	64,825	763,231	11.77	67,494	837,554	12.41
Metallurgy	36,670	491,645	13.41	22,489	294,919	13.11
Paints	12,340	149,967	12.15	17,679	215,441	12.19
Paper mills	44,424	499,630	11.25	52,251	636,442	12.18
Petroleum	26,558	310,894	11.71	26,503	316,100	11.93
Sewage and trade-waste treatment	48,285	559,870	11.60	52,855	630,145	11.92
Sugar refining	26,347	427,864	16.24	24,635	400,802	16.27
Tanneries	42,604	492,578	11.56	47,556	565,178	11.88
Water purification	230,819	2,532,456	10.97	225,638	2,540,915	11.26
Undistributed [1]	24,162	267,475	11.07	37,504	462,692	12.34
Unspecified	58,054	675,559	11.64	74,911	864,313	11.54
Total	648,667	7,579,187	11.68	689,172	8,257,796	11.98
Grand total, hydrated lime	1,693,946	20,854,543	12.31	1,885,101	24,121,563	12.80

[1] Includes cement products, glass, glue, grease (lubricating) 85-percent magnesia (1949 only), medicines and drugs, oil-well drilling, rubber, wood distillation, and miscellaneous industrial uses.

To furnish a more comprehensive picture of the various materials used for liming land table 9 shows, in addition to agricultural lime, the quantities of oystershell, limestone, and calcareous marl that are applied to soil amendment.

TABLE 9.—Agricultural lime and other liming materials sold by producers in the United States, 1949–50, by kinds

Kind	1949 Short tons Gross weight	1949 Short tons Effective lime content [1]	1949 Value Total	1949 Value Average	1950 Short tons Gross weight	1950 Short tons Effective lime content [1]	1950 Value Total	1950 Value Average
Lime:								
Quicklime	111,813	95,040	$1,063,125	$9.51	103,823	88,250	$1,037,222	$9.99
Hydrated lime	216,715	151,700	2,481,195	11.45	228,864	160,200	2,567,149	11.22
Oystershells (crushed) [2]	38,366	18,030	268,458	7.00	55,075	25,890	320,557	5.82
Limestone	21,482,910	10,096,970	33,251,141	1.55	19,348,820	9,093,950	30,393,075	1.57
Calcareous marl [3]	166,800	70,060	231,975	1.39	347,843	146,090	246,451	.71
Total		10,431,800	37,295,894			9,514,380	34,564,454	

[1] Calculated upon basis of average percentages used by the National Lime Association, as follows: Quicklime (including lime from oystershells), 85 percent; hydrated lime, 70 percent; pulverized uncalcined limestone and oystershells, 47 percent; calcareous marl, 42 percent.
[2] Figures compiled by Fish and Wildlife Service.
[3] The great increase in calcareous marl in 1950 compared with 1949 was due in part to more complete coverage of marl producers in Michigan.

Apparent Consumption by States.—Lime plants are widely distributed, and most of the lime manufactured is used in local market areas. However, as some States produce a surplus and others are deficient in production, considerable quantities enter interstate trade as indicated in table 10. Furthermore, limes vary considerably in physical and chemical properties, and the peculiar needs of consuming industries commonly demand shipments from distant points. The principal States that exported lime beyond their borders in 1950 were Ohio, Missouri, Pennsylvania, West Virginia, and Virginia. Data on origin and destination of lime shipments, by States and groups of States, are given in tables 11 and 12.

TABLE 10.—Apparent consumption of open-market lime in continental United States in 1950, by States, in short tons

State	Sales by producers	Shipments from State [1]	Shipments into State	Apparent consumption		
				Quicklime	Hydrated lime	Total
Alabama	389,071	114,409	31,446	293,535	12,573	306,108
Arizona	51,530	9,363	2,189	40,746	3,610	44,356
Arkansas	(2)	(2)	(2)	31,504	8,134	39,638
California	171,440	27,201	66,364	158,936	51,667	210,603
Colorado			25,807	19,058	6,749	25,807
Connecticut	(2)	(2)	(2)	22,338	26,858	49,196
Delaware			59,435	42,101	17,334	59,435
District of Columbia			16,933	166	16,767	16,933
Florida	(2)		(2)	47,366	52,193	99,559
Georgia	11,998	600	75,270	49,783	36,885	86,668
Idaho			5,058	3,244	1,814	5,058
Illinois	367,485	180,611	354,998	409,318	132,554	541,872
Indiana	(2)	(2)	(2)	203,330	42,100	245,430
Iowa			107,074	86,390	20,684	107,074
Kansas			44,018	24,951	19,067	44,018
Kentucky			234,098	209,156	24,942	234,098
Louisiana			109,025	77,682	31,343	109,025
Maine	(2)		(2)	72,265	5,662	77,927
Maryland	64,687	18,323	127,571	126,909	47,026	173,935
Massachusetts	139,357	85,591	54,230	47,708	60,288	107,996
Michigan	(2)	(2)	(2)	277,533	76,509	354,042
Minnesota	(2)	(2)	(2)	76,985	18,882	95,867
Mississippi			22,460	16,592	5,868	22,460
Missouri	1,035,176	892,146	29,285	121,054	51,261	172,315
Montana	(2)	(2)	(2)	21,663	3,275	24,938
Nebraska			11,875	2,549	9,326	11,875
Nevada	(2)	(2)	(2)	27,917	1,771	29,688
New Hampshire			10,627	3,373	7,254	10,627
New Jersey	(2)	(2)	(2)	78,569	131,662	210,231
New Mexico			7,106	1,216	5,890	7,106
New York	(2)	(2)	(2)	327,092	165,909	493,001
North Carolina			61,718	22,250	39,468	61,718
North Dakota			7,176	3,135	4,041	7,176
Ohio	2,142,344	1,470,988	306,050	802,420	174,986	977,406
Oklahoma	(2)	(2)	(2)	21,679	19,937	41,616
Oregon	(2)		(2)	36,656	18,716	55,372
Pennsylvania	1,086,451	453,134	595,715	985,726	243,306	1,229,032
Rhode Island			15,804	7,380	8,424	15,804
South Carolina			18,819	7,037	11,782	18,819
South Dakota	(2)		(2)	2,770	3,003	5,773
Tennessee	98,232	78,482	24,147	13,627	30,270	43,897
Texas	216,439	24,871	38,189	176,125	53,632	229,757
Utah	49,419	1,032	37,406	80,822	4,971	85,793
Vermont	32,843	31,860	1,398	255	2,126	2,381
Virginia	428,339	357,700	91,067	111,341	50,365	161,706
Washington	(2)	(2)	(2)	27,404	9,732	37,136
West Virginia	375,779	367,578	239,985	225,316	22,870	248,186
Wisconsin	124,530	62,016	77,201	94,704	45,011	139,715
Wyoming			1,675	508	1,167	1,675
Undistributed [2]	676,989	284,251	1,466,676			
Total	7,462,109	4,460,156	4,377,895	5,540,184	1,839,664	7,379,848

[1] Includes 82,261 tons exported or unclassified as to destination.
[2] Figures that may not be shown separately are combined as "Undistributed."

TABLE 11.—Apparent consumption of open-market lime in continental United States in 1950, by region of origin and destination in short tons

Destination	Origin														
	Illinois, Indiana, Michigan, Ohio			Maryland, New Jersey, New York, Pennsylvania, West Virginia			Connecticut, Maine, Massachusetts, Vermont			Florida, Georgia, Virginia			Alabama, Tennessee		
	Quick-lime	Hydrated lime	Total	Quick-lime	Hydrated lime	Total	Quick-lime	Hydrated lime	Total	Quick-lime	Hydrated lime	Total	Quick-lime	Hydrated lime	Total
Illinois, Indiana, Michigan, Ohio	1,204,408	342,901	1,547,309	93,632	5,672	99,304	330	60	390	53,844	5,232	59,076	797	2,065	2,862
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	460,039	206,793	666,832	1,009,288	382,091	1,391,379	40,349	24,455	64,804	215,520	21,966	237,486	8,580	916	9,496
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	1,555	32,528	34,083	65,011	7,049	72,060	83,732	69,107	152,839	2,160	105	2,265	-----	1,260	1,260
Florida, Georgia, North Carolina, South Carolina, Virginia	7,043	89,481	96,524	36,306	7,382	43,688	24	-----	24	100,655	61,502	162,157	90,169	31,415	121,584
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	74,743	42,360	117,103	1,951	421	2,372	-----	-----	-----	3,823	898	4,721	314,477	28,163	342,640
Arkansas, Kansas, Nebraska, Oklahoma, Texas	9,804	11,085	20,889	27	-----	27	-----	-----	-----	-----	-----	-----	1,191	750	1,941
Iowa, Minnesota, Missouri, Wisconsin	51,359	51,955	103,314	-----	459	459	-----	-----	-----	689	38	727	-----	-----	-----
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	26,196	7,619	33,815	-----	-----	-----	-----	-----	-----	-----	300	300	-----	-----	-----

Destination	Origin											
	Arkansas, Oklahoma, Texas			Minnesota, Missouri, Wisconsin			Arizona, California, Colorado, Montana, Nevada, Oregon, South Dakota, Utah, Washington			Total		
	Quicklime	Hydrated lime	Total	Quicklime	Hydrated lime	Total	Quicklime	Hydrated lime	Total	Quicklime	Hydrated lime	Total
Illinois, Indiana, Michigan, Ohio	61	171	232	339, 529	70, 048	409, 577	----------	----------	----------	1, 692, 601	426, 149	2, 118, 750
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	----------	----------	----------	52, 103	8, 653	60, 756	----------	----------	----------	1, 785, 879	644, 874	2, 430, 753
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	----------	----------	----------	861	563	1, 424	----------	----------	----------	153, 319	110, 612	263, 931
Florida, Georgia, North Carolina, South Carolina, Virginia	----------	----------	----------	3, 580	913	4, 493	----------	----------	----------	237, 777	190, 693	428, 470
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	39, 139	18, 167	57, 306	176, 459	14, 987	191, 446	----------	----------	----------	610, 592	104, 996	715, 588
Arkansas, Kansas, Nebraska, Oklahoma, Texas	198, 294	70, 513	268, 807	43, 592	27, 218	70, 810	3, 900	530	4, 430	256, 808	110, 096	366, 904
Iowa, Minnesota, Missouri, Wisconsin	8, 061	237	8, 298	319, 024	83, 149	402, 173	----------	----------	----------	379, 133	135, 838	514, 971
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	1, 598	4, 931	6, 529	54, 047	18, 872	72, 919	342, 234	84, 684	426, 918	424, 075	116, 406	540, 481

TABLE 12.—Apparent consumption of open-market hydrated lime from plants in Ohio and total continental United States in 1950, by region of destination

Destination	From Ohio plants			From all plants in continental United States	
	Short tons	Distribution (percent)	Percent of total shipments	Short tons	Distribution (percent)
Illinois, Indiana, Michigan, Ohio	307,013	42	72	426,149	23
Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, West Virginia	206,653	28	32	644,874	34
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	32,528	5	29	110,612	6
Florida, Georgia, North Carolina, South Carolina, Virginia	89,404	12	47	190,693	10
Alabama, Kentucky, Louisiana, Mississippi, Tennessee	37,377	5	36	104,996	6
Arkansas, Kansas, Nebraska, Oklahoma, Texas	10,415	1	9	110,096	6
Iowa, Minnesota, Missouri, Wisconsin	35,152	5	26	135,838	7
Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming	7,313	1	6	116,406	6
Undistributed and exports	3,971	1	13	30,937	2
Total	729,826	100	39	1,870,601	100

The small quantities of lime shipped from the United States to various island Territories and possessions are shown in table 13.

TABLE 13.—Lime shipped to Territories and possessions of the United States, 1947–50

[U. S. Department of Commerce]

Territory or possession	1947		1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Guam			1	$64				
Hawaii	833	$17,330	(1)	(1)	(1)	(1)	(1)	(1)
Puerto Rico	2,698	27,844	1,912	30,508	5,964	$112,334	5,056	$92,086
Virgin Islands	57	1,603	100	2,313	256	7,268	273	8,070

[1] Data not available.

PRICES

The uptrend in prices continued in 1950; the average selling price, f. o. b. plant, was $11.13 per short ton compared with $10.97 in 1949. The average selling price of quicklime in 1950 was $10.57 ($10.48 in 1949), and of hydrated lime $12.80 ($12.31 in 1949).

FOREIGN TRADE [2]

Imports.—Imports of lime into the United States which are relatively small originate chiefly in Canada to satisfy local needs in border areas, particularly in the State of Washington. Imports during recent years are indicated in tables 14 and 15.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 14.—Lime imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Hydrated lime		Other lime		Dead-burned dolomite [1]		Total	
	Short tons [2]	Value	Short tons [2]	Value	Short tons [2]	Value	Short tons [2]	Value
1946	611	$8,538	24,664	$248,311			25,275	$256,849
1947	1,903	24,588	25,454	271,253	53	$2,194	27,410	298,035
1948	2,861	48,157	30,336	401,473	2,427	91,613	35,624	541,243
1949	1,674	35,129	30,807	545,792	1,851	72,680	34,332	653,601
1950	1,253	23,910	30,904	524,132	2,127	86,425	34,284	634,467

[1] "Dead-burned basic refractory material consisting chiefly of magnesia and lime."
[2] Includes weight of immediate container.

TABLE 15.—Lime imported for consumption in the United States, 1948–50, by countries and customs districts [1]

[U. S. Department of Commerce]

Country of origin	Customs district of entry	1948		1949		1950	
		Short tons [2]	Value	Short tons [2]	Value	Short tons [2]	Value
Canada	Alaska	(3)	$1				
	Buffalo	6,680	63,263	2,824	$27,145	7,847	$76,892
	Duluth and Superior	51	558	(3)	2	4	100
	Maine and New Hampshire	166	1,087	116	741	85	688
	Michigan	252	3,919			6	485
	Montana and Idaho	80	760				
	Vermont	1,405	15,850				
	Washington	24,563	364,192	29,541	553,033	24,214	469,852
United Kingdom	Virginia					1	25
Total		33,197	449,630	32,481	580,921	32,157	548,042

[1] Exclusive of dead-burned basic refractory material.
[2] Includes weight of immediate container.
[3] Less than 0.5 ton.

Exports.—Exports are also relatively small as indicated in table 16. Canada and Latin America are the principal foreign markets.

TABLE 16.—Lime exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Short tons	Value	Year	Short tons	Value
1945	24,276	$268,875	1948	63,088	$865,157
1946	33,540	423,948	1949	59,927	937,444
1947	50,784	713,703	1950	50,491	825,927

TABLE 17.—Lime exported from the United States, 1948–50, by countries

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Argentina	28	$983	2	$154	4	$284
Bahamas	65	1,850	58	1,115	15	360
Belgium-Luxembourg	59	3,840	75	3,872		
Brazil	7	597	1	106	6	885
British Honduras			101	1,551		
British Western Pacific Islands			140	3,795		
Canada	29,127	291,639	17,304	199,855	18,725	260,195
Newfoundland-Labrador	38	786				
Canal Zone	738	13,675	87	2,491		
Chile	100	2,096	5,021	83,387	5	174
Colombia	1,563	27,877	2,369	46,501	3,643	81,082
Costa Rica	7,736	108,338	8,244	144,785	8,225	141,902
Cuba	1,153	18,529	40	709	20	641
Dominican Republic	461	8,140	611	10,970	624	11,654
El Salvador	54	1,618	55	1,829	75	2,999
Haiti	622	9,661	275	5,119	309	5,846
Honduras	10,200	140,602	9,393	148,318	8,367	136,554
Liberia	39	902			10	140
Mexico	3,073	52,458	7,254	91,160	4,541	67,405
Netherlands Antilles	225	4,680	156	3,148	277	5,112
New Zealand			100	2,016		
Nicaragua	35	1,740	345	6,866	231	4,489
Panama	4,282	58,936	6,123	109,199	3,859	67,697
Peru	61	1,805				
Philippines	320	6,578	507	20,351	240	6,939
Saudi Arabia	264	7,159	19	1,228	90	2,612
Sweden	171	11,484				
United Kingdom	913	55,640	456	23,940		
Venezuela	1,508	26,420	980	19,206	1,104	22,437
Other countries	246	7,124	211	5,773	121	6,520
Total	63,088	865,157	59,927	937,444	50,491	825,927

NEW DEVELOPMENTS

Committee C–7 on Lime of the American Society for Testing Materials is making progress toward establishing specifications for hydrated lime for grease manufacture, quicklime for calcium carbide manufacture, and lime used for treating leather. The committee is working in cooperation with Committee C–14 on Glass in perfecting methods for determining the iron content of lime. It is also sponsoring research on popping and pitting. The framing of a specification for agricultural liming materials is not favored by the committee.[3]

The Armour Research Foundation claims to have developed a procedure for preparing completely hydrated dolomitic lime without employing the autoclave treatment now used in the manufacture of finishing lime. The method can also be used to prepare high-calcium finishing limes of any desired plasticity. Details of the new method have not yet appeared.[4]

Technical problems in lime burning have been discussed in some detail by Gibbs. The elements of sensible heat, latent heat, and time are described in their relation to the calcination process. Heat losses, fuel efficiency, and kiln design are other subjects covered.[5]

[3] American Society for Testing Materials, Lime: Bull. 167, July 1950, p. 31.
[4] Miller, Thomas C., Ceramics at Armour Research Foundation: Am. Ceram. Soc. Bull., vol. 29, No. 11, November 1950, p. 422.
[5] Gibbs, Ralph, Thermodynamics of Lime Manufacture: Rock Products, vol. 53, No. 2, February 1950, pp. 118–122, 143; No. 6, June 1950, pp. 122–124; No. 10, October 1950, pp. 110–112.

Instrument control is becoming increasingly important as a means of promoting efficiency in lime burning. Helpful suggestions on the subject have been supplied by Warner.[6]

A new quick process for production of the so-called aged lime putty has been developed by the Miller-Komline Co., Peapack, N. J.[7]

Azbe has proposed a new design for rotary kilns to conserve heat and promote general efficiency.[8]

The city of Miami, Fla., now operates a rotary-kiln lime plant to calcine sludge that accumulates from treatment of the municipal water supply. The plant not only supplies all the lime needed for water treatment but produces surplus lime for sale, because the sludge consists of both the lime added to the water and the precipitated lime originally dissolved in the water.[9]

[6] Warner, Irving, Practical Aspects of Instrumentation: Rock Products, vol. 53, No. 5, May 1950, pp. 64–65, 105.

[7] Pit and Quarry, Novel Mixing Set-up Expedites Production of Slaked, Aged Lime Putty: Vol. 43, No. 3, October 1950, p. 60.

[8] Azbe, Victor J., New Concept of Rotary-Kiln Plant: Rock Products, vol. 53, No. 3, March 1950, pp. 99–102, 124–128.

[9] Cliff, W. R., and Atherton, C. R., Calcination of Carbonate Sludge: Rock Products, vol. 53 N March 1950, pp. 106–110.

Magnesium

By H. B. Comstock

GENERAL SUMMARY

CONSUMPTION of magnesium, which has been increasing progressively since 1947, continued to rise at a greater rate in 1950. The rising demand stimulated a marked rise in production to 15,726 tons, 36 percent more than in 1949. The production rate at the end of the year was about 4 million pounds per month compared with an estimated demand of 5 million pounds. The total output of primary magnesium for the year was from the Dow Chemical Co. plant at Freeport, Tex. Recovery of magnesium from secondary sources in 1950 increased 30 percent over 1949 and totaled 7,740 short tons. Consumption exceeded production by more than 4,000 tons, the excess being drawn from producers' stocks.

The price of domestic primary magnesium, which had remained stable at 20.5 cents per pound from 1943 to 1950, increased three times during 1950. In June the price increased to 21.5 cents, in July to 22.5 cents, and in September to 24.5 cents per pound.

The world production of magnesium for 1950 is estimated at 40,000 metric tons (44,000 short tons), a 14-percent increase over 1949. More than a third was produced by United States; the remainder was produced chiefly by the U. S. S. R., United Kingdom, Canada, and France.

The outstanding influence in the industry has been the increasing demand for structural products by the armed forces and purchases for the National Strategic Stockpile. A sum of $9 million was appropriated by Congress for reactivating six of the seven Government-owned magnesium plants to supplement production from the Freeport plant.

TABLE 1.—Salient statistics of the magnesium metal industry in the United States, 1941–45 (average) and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Production:						
Primary magnesium [1] short tons	87,747	5,317	12,344	10,003	11,598	15,726
Secondary magnesium [1] do	8,565	5,117	9,503	7,553	5,962	7,740
Average quoted price per pound, primary [2] cents	21.6	20.5	20.5	20.5	20.5	22.0
Consumption, apparent short tons	77,720	8,709	4,949	8,215	12,545	19,784
Exports [3] do	12,549	278	355	444	708	908
World production do	[4] 150,000	[4] 26,000	[4] 35,000	[4] 35,000	[4] 39,000	44,000

[1] Ingot equivalent.
[2] Magnesium ingots (99.8 percent) in carlots. Before Dec. 1, 1947, in New York. Subsequently, f. o. b. Freeport, Tex. (Source: Metal Statistics, 1951.)
[3] Magnesium metal 1941–42 and metal and alloys 1943–50.
[4] Revised figure.

PRODUCTION

Primary.—The output of the only domestic producer of primary magnesium, the Freeport, Tex., plant of the Dow Chemical Co., was 15,726 short tons for 1950 or 36 percent above 1949. The annual capacity of this plant was increased to 24,000 tons. Plans were under way for the further increase of primary magnesium production by reactivation of the Government-owned magnesium plants to supply Government requirements for the metal in the defense program, as provided in the Critical Materials Stockpiling Act (Pub., 520, 79th Cong., 2d sess., as amended), the National Reserve Act of 1948 (Pub., 883, 80th Cong., 2d sess.), and the Defense Production Act (Pub., 774, 81st Cong.). Six of these plants were expected to start production by July 1951. The seventh, at Luckey, Ohio, has been operated by the Brush-Beryllium Co. since May 1949 for production of beryllium, and it had not yet been determined whether it would be converted to the production of magnesium. The total production capacity after the reactivation program was completed was to be about 127,000 tons per year.

TABLE 2.—Production of primary magnesium in the United States, 1949–50, by months, in short tons

Month	1949	1950	Month	1949	1950
January	988	1,002	August	970	1,400
February	884	913	September	974	1,635
March	988	948	October	941	1,690
April	958	957	November	969	1,760
May	987	972	December	1,004	1,942
June	950	1,175			
July	985	1,332	Total	11,598	15,726

The Government-owned plants are as follows:

	Capacity (tons)
Electrolytic process:	
Painesville, Ohio	18,000
Velasco, Tex	36,000
Ferrosilicon process:	
Luckey, Ohio	5,000
Spokane, Wash	24,000
Manteca, Calif	10,000
Wingdale, N. Y	5,000
Canaan, Conn	5,000

The Painesville, Ohio, plant was operated during World War II by the Diamond Magnesium Co., a wholly owned subsidiary of Diamond Alkali Co. It produced 42,162 tons of magnesium ingot before it was closed in September 1945.

The Velasco, Tex., plant, operated by Dow Chemical Co. during World War II, produced 83,500 tons of magnesium ingot before it was closed September 19, 1945. This plant probably can produce at 130 percent of its rated capacity of 36,000 tons per year if necessary.[1] It is considered the most economical of the Government-owned plants.

[1] Surplus Property Administration, Magnesium Plants and Facilities: Report to the Congress, Dec. 7 1945, p. 37.

The Spokane, Wash., plant did not get into full operation during World War II owing to the late date of its completion and labor problems in the Northwest at that time. It did, however, produce 12,000 tons of primary magnesium and 12,000 tons of ferrosilicon before it was closed in November 1944. This plant is an entirely complete production unit; it has its own dolomite quarry and calcining equipment and its own facilities to produce ferrosilicon.

The Manteca, Calif., plant, operated by Permanente Metals Co., was closed June 1, 1944, after it had produced 12,795 tons of magnesium. The ferrosilicon furnaces are at Permanente, Calif., and the dolomite quarry and calcining facilities at Natividad, Calif.

The two smallest defense plants, at Wingdale, N. Y. and Canaan, Conn., are similar in design and in most other respects and are approximately 35 miles apart. The Wingdale magnesium plant produced 2,227 tons of ingot before it was closed on June 1, 1944, but it never operated at capacity. The Canaan plant served as a pilot plant for the other ferrosilicon reduction plants during World War II; it produced 9,000 tons of magnesium and 500 tons of metallic calcium before it was closed September 19, 1947.

It is estimated that the fabrication capacity of magnesium doubled during the 2 years, 1949–50. Present rolling-mill capacity for sheet is 200 tons monthly. Rolling-mill facilities were augmented in 1950 by the establishment of a rolling mill in New Kensington, Pa., and will be further increased when the former Standard Steel Spring plant at Madison, Ill., is put into operation. Plans were under way for the installation in the Madison plant of the first modern continuous rolling mill for magnesium. During 1950 about 65 firms were regularly producing magnesium castings. Production of wrought products exceeded that of castings for the first time in the history of the magnesium industry. Many improvements, resulting in decreased labor costs, have been made in producing wrought products.

Secondary.—Recovery of secondary magnesium, including alloying ingredients and secondary magnesium incorporated in primary ingot, totaled 7,740 short tons in 1950 compared with 5,962 short tons in 1949. Of this quantity, 7,568 tons was recovered from 8,367 tons of magnesium-base scrap in 1950. Old scrap constituted about 62 percent of the scrap consumed compared with 48 percent in 1949. Of the 1950 recovery, 3,682 tons was in ingot form, 2,504 tons in castings, 281 tons in magnesium-alloy shapes, 810 tons in aluminum-base alloys, 57 tons in zinc-base alloys, 311 tons in anodes and strip for cathodic protection, and 95 tons in chemicals and other nonrecoverable forms. Additional information on secondary magnesium may be found in the Secondary Metals—Nonferrous chapter of this volume.

CONSUMPTION AND USES

Total consumption of primary magnesium in 1950 amounted to 18,051 tons, an increase of 6,104 tons above 1949 consumption and 2,325 tons higher than 1950 production. The excess represents withdrawals from inventories.

Transportation equipment continued to consume the largest amount of magnesium. Perhaps the most significant increase in the use of magnesium was in die castings for automotive parts. The production

TABLE 3.—Production, sales, exports, and apparent consumption of primary magnesium in the United States, 1946–50, in short tons

Year	Production		Sales	Exports [1]	Apparent consumption [2]
	Raw, crude, and pure ingot	Ingot equivalent			
1946	5,317	5,317	8,916	207	8,709
1947	12,344	12,344	5,264	315	4,949
1948	10,003	10,003	8,489	274	8,215
1949	11,598	11,598	12,977	432	12,545
1950	15,726	15,726	20,370	586	19,784

[1] Primary metal only.
[2] Does not consider fluctuations in consumers' stocks and metal derived from scrap. Net withdrawals from producers' stocks were 3,599 tons in 1946, 1,379 in 1949, and 4,464 in 1950. Net additions to producers' stocks were 7,080 tons in 1947 and 1,514 tons in 1948.

of permanent mold castings showed the first major increase since 1945, rising from 44 tons in 1949 to 573 tons in 1950. The principal use of the metal in the aircraft industry was for structural parts of the engines and wheels. The amount of magnesium sheet used for stressed skin applications in aircraft also increased. There were other increases in use of magnesium in fabricating such equipment as paper-mill rolls, portable tools, ladders, dockboards, grain shovels, gangplanks, and hand trucks, where weight saving is very important. Magnesium die castings are well-established in calculators and business machines.

Although the most important use for magnesium is as a structural metal, it is also finding increased application for other purposes. The use of magnesium for cathodic protection, which had consumed less than 500 tons in previous years, increased to 1,937 tons in 1950. The protection of steel ground pipe from corrosion by using sacrificial magnesium anodes is now an established practice. Its use as a constituent

TABLE 4.—Actual domestic consumption of primary magnesium (ingot equivalent and magnesium content of magnesium-base alloys) by uses, 1946–50, in short tons

Product	1946	1947	1948	1949	1950
Structural products:					
Castings:					
Sand	920	892	1,930	3,088	3,090
Die	341	182	213	127	242
Permanent mold	38	9	12	44	573
Sheet	1,990	1,053	1,261	2,155	3,357
Structural shapes, rods, tubing (extrusions)	2,689	1,619	2,529	3,364	3,400
Forgings	99	105	103	200	104
Total structural	6,077	3,860	6,048	8,978	10,766
Other products:					
Powder	192	9	(1)	--------	56
Aluminum alloys	2,391	1,935	2,171	1,759	3,722
Other alloys	41	40	43	39	255
Scavenger and deoxidizer	248	427	418	404	473
Chemical	150	266	407	224	373
Cathodic protection	774	94	385	235	1,937
Other [2]		238	226	308	469
Total other products	3,796	3,009	3,650	2,969	7,285
Grand total	9,873	6,869	9,698	11,947	18,051

[1] Less than 0.5 ton.
[2] Includes primary metal consumed in making secondary alloy.

in producing aluminum alloys increased more than 100 percent over 1949. Substantial quantities of magnesium are being consumed in the reduction of titanium and zirconium. Small amounts of magnesium are added to gray cast iron before pouring to produce a so-called nodular cast iron with improved strength and ductility. Other applications that are consuming increased amounts of magnesium are zinc and nickel alloys and photoengraving printing processes involving direct printing from magnesium plates.

STOCKS

Inventories of primary magnesium ingot at Freeport, Tex., the only plant producing in 1950, declined to about 20 percent of annual production by December 31. Total consumers' stocks of primary metal dropped to about 1,650 tons. Thus, total stocks decreased in 1950 to less than 2 months' supply at the year-end rate of consumption. Government agencies continued to hold large quantities of surplus magnesium left from stocks accumulated during World War II. In September magnesium was placed on the list of materials to be purchased for the National Stockpile.

PRICES

The base price of primary magnesium, which had remained at 20.5 cents per pound since January 1943, was increased in June to 21.5 cents; in July the price advanced to 22.5 cents and in September to 24.5 cents per pound. These increases were part of the increase that occurred in prices of metals generally.

FOREIGN TRADE [2]

Imports.—Total imports of magnesium during 1950 decreased to 868 tons, only 34 percent of those for 1949. Of the 843 tons of metal and scrap imported, 333 were from France, 203 from Germany, 91 from United Kingdom, 74 from Belgium and Luxembourg, 65 from Italy, 40 from India, 23 from French Morocco, 10 from Canada, 3 from the Netherlands, and 1 from the Bahamas. Tariff rates on magnesium in 1950 were as follows: Metallic, 20 cents per pound; alloys, powder, sheets, tubing, wire, manufactures, etc., 20 cents per pound on magnesium content plus 10 percent ad valorem; and metallic scrap, 20 cents per pound until October 1, 1950 when the duty was suspended.

Exports.—Total exports of magnesium were 908 tons in 1950, an increase of 28 percent over the 708 tons shipped in 1949. Of the metal exported in primary form during 1950, 470 tons went to Mexico, 110 to Argentina, and the remaining 6 to three other countries. The United Kingdom received 146 tons of the metal exported as powder, ribbons, and other forms; Colombia received 100 tons; Canada, 40 tons; Saudi Arabia, 17 tons; Venezuela, 11 tons; and other countries, 8 tons.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 5.—Magnesium imported for consumption and exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Imports						Exports			
	Metallic and scrap		Alloys (magnesium content)		Sheets, tubing, ribbons, wire, and other forms (magnesium content)		Metal in primary form		Powder, ribbons, and metal in other forms	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	241	$110,983	(1)	$3	(1)	$621	207	$85,382	[2] 71	[2] $50,144
1947	201	87,499			1	11,902	315	140,214	40	80,210
1948	678	184,066	(1)	57	(1)	943	274	122,374	170	149,891
1949	2,560	537,113	(1)	80	(1)	28	432	184,707	276	214,732
1950	843	218,129	3	5,056	22	38,280	586	245,539	322	213,641

[1] Less than 0.5 ton.
[2] Revised figure.

TECHNOLOGY

Magnesium has two advantages over other metals that are likely to have an increasing effect in extending its use as a structural metal. It is the lightest of the metals available for structural uses, and the raw materials for its production are virtually unlimited. Weight saving is becoming increasingly important in transportation, military equipment, and reducing inertial stresses created by rapid acceleration and deceleration of moving parts in machines. Likewise, the rising costs of labor are placing increased values on lightness in tools and equipment to be moved by hand. The unique position of magnesium alloys as a lightweight structural metal is stimulating more and more interest in development of alloys and techniques for fabrication. The abundance of sea water, carnallite, and dolomite as raw materials for production of magnesium, at a time when depletion of ores of other structural metals is becoming critical, is another reason for increased attention to the technology of magnesium to extend its field of application.

All production of primary magnesium for 1950 came from the Dow Chemical Co. plant at Freeport, Tex., which extracts magnesium from sea water. The essential steps of the process are summarized as follows: [3]

Sea water, which contains 0.13 percent magnesium, is mixed with a slurry of calcium hydroxide or milk of lime. The magnesium in solution in the sea water is precipitated as magnesium hydroxide because of its greater insolubility. The precipitated magnesium hydroxide settles out of the sea water in large settling tanks or Dorr thickeners and is pumped from the bottom of the tank as a thin slurry containing about 17 percent magnesium hydroxide by weight. Precipitation of the magnesium permits elimination of about 98 percent of the volume of sea water in the first step of the process.

[3] Shigley, C. M., Minerals from the Sea: Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 191, No. 1, January 1951, pp. 25–29.

The magnesium hydroxide slurry is filtered and neutralized with hydrochloric acid to form a 15-percent solution of magnesium chloride. The magnesium chloride solution is evaporated and dehydrated to a composition having the approximate composition $MgCl_2 \cdot 1\frac{1}{2}\ H_2O$, the material fed to the electrolytic cells for reduction to metallic magnesium.

Important developments in magnesium alloys were made during the year in the use of rare-earth metals and zirconium as alloying constituents; there was also further investigation of magnesium-lithium alloys. Zirconium was added to magnesium-zinc alloys for grain refining. The alloy ZK 61, containing 5.5–6.5 percent Zn and 0.7–0.9 percent Zr, is reported to have the highest strength : weight ratio of any commercial casting alloy.[4] Rare earths in amounts up to 3 percent are added to magnesium alloys to improve the mechanical properties at elevated temperatures (creep strength).

A good deal of attention has been given by research metallurgists to the study of magnesium-lithium alloys.[5] The hexagonal alpha structure of magnesium is changed to the more ductile and workable body-centered-cubic beta structure by adding 10 percent lithium, but these alloys are subject to overaging and loss of strength at temperatures of 150°–200° C. The ductility of such alloys is destroyed by even small traces of sodium, so sodium-free metals must be used. Sodium may be removed by using a LiCl–LiF flux, bubbling nitrogen into the melt, or by absorption of the sodium by an immersed graphite rod.

Magnesium alloys containing lithium absorb oxygen and nitrogen from the air; therefore special equipment and techniques were devised in Bureau of Mines laboratories for preparing and melting such alloys. This procedure involved vacuum treatment of the charge to eliminate absorbed gases and maintaining an atmosphere of helium around the metal during melting and casting. This technique has permitted the casting and rolling of alloys containing as much as 40 percent lithium.

A technique was developed in the laboratory whereby magnesium powder was extruded directly to form rods ⅜ inch in diameter or strips having a cross section of ¾ by 1/16 inch.[6]

WORLD REVIEW

The estimated world production of primary magnesium in 1950 was 40,000 metric tons, or about 14 percent above the 1949 total. World markets reflected an appreciable gain in military consumption. Strongest increases in civilian consumption were noted in the United States.

---

[4] Meier, J. W., A High-Strength Magnesium Casting Alloy: Modern Metals, vol. 5, No. 12, January 1950, pp. 26–28.

[5] Busk, R. S., Leman, D. L., and Casey, J. J., The Properties of Some Magnesium-Lithium Alloys Containing Aluminum and Zinc: Am. Inst. Min. and Met. Eng., Jour. of Metals, vol. 188, No. 7, July 1950, pp. 945–951.

Frost, P. D., Jackson, J. H., Loonam, A. C., and Lorig, C. H., The Effect of Sodium Contamination on Magnesium-Lithium Base Alloy: Am. Inst. Min. and Met. Eng., Jour. of Metals, vol. 188, No. 9, September 1950, pp. 1171–1172.

Frost, P. D., Kura, J. G., and Eastwood, L. W., Aging Characteristics of Magnesium-Lithium Base Alloys: Am. Inst. of Min. and Met. Eng., Jour. of Metals, vol. 188, No. 10, October 1950, pp. 1277–1282.

Barrett, C. S., and Clifton, D. F., Transformation Characteristics of a Lithium-Magnesium Alloy: Am. Inst. of Min. and Met. Eng., Jour. of Metals, vol. 188, No. 11, November 1950, pp. 1329–1332.

[6] Busk, R. S., and Leontis, T. E., The Extrusion of Powdered Magnesium Alloys: Am. Inst. of Min. and Met. Eng., Jour. of Metals, vol. 188, No. 2, February 1950, p. 297.

TABLE 6.—World production of magnesium metal, by countries, 1944–50, in metric tons [1]

[Compiled by Pauline Roberts]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Australia	54						
Canada	4,799	3,338	145	136	(2)	(2)	1,606
China:							
Formosa	432	21				(2)	(2)
Manchuria	450	200				(2)	(2)
France	703	279	704	1,043	1,507	[3] 700	300
Germany:							
Federal Republic	33,600	(2)			[4] 17		(2)
Soviet Zone			(2)	(2)	(2)	(2)	(2)
Italy	1,380	346	1,005				
Japan	2,904	1,104					
Korea	1,628	1,014					
Norway (estimate)	2,000						(2)
Switzerland (estimate)	1,000	500	300	500			
United Kingdom	13,094	[5] 6,900	[5] 1,700	[5] 2,500	[5] 3,500	[5] 5,100	[5] 4,900
United States	142,518	29,748	4,823	11,198	9,075	10,521	14,266
Total (estimate) [6]	218,000	62,000	24,000	32,000	32,000	35,000	40,000

[1] Magnesium is also produced in U.S.S.R., but production data are not available; estimate by author of chapter included in total.
[2] Data not available; estimate by author of chapter included in total.
[3] Estimated figure.
[4] British and American zones only.
[5] Includes secondary metal.
[6] 1944–49 figures revised.

Canada.—The ferrosilicon plant of Dominion Magnesium, Ltd., at Haley, Ontario, resumed production in July 1950, at the annual rate of 5,000 metric tons and was the only plant to produce primary magnesium in Canada during the year. It had been shut down since 1946. No plans are being made to expand production facilities. About 80 percent of the magnesium produced is exported. Most of the exports are destined for the United Kingdom. Of the 20 percent consumed in the country, 10 percent is used in making aluminum alloys, and the other 10 percent is used in the Dominion Magnesium, Ltd., extrusion plant and casting foundry.[7]

U. S. S. R.—It was reported that magnesium is produced in the plant near Solikamsk in the Ural Mountains, using carnallite from the local potash deposits, and that present production of this plant has probably risen to 5,000 tons or more.[8] Postwar production in Russia may have been further increased by transfer to that country of the Aachen, Germany, plant with an estimated annual capacity of 12,000 tons and transfer of the 20,000-ton plant from the Soviet zone of Austria.[9]

United Kingdom.—Two privately owned plants produced over 4,000 metric tons of magnesium in 1950, part of which was secondary metal. Three Government-owned magnesium plants ceased operations in 1950, and one of them was dismantled.[10] Annual production of magnesium in Britain was expanded, under Government control, after 1940 until it reached a figure of 20,000 to 30,000 tons for all makers.

[7] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 6, December 1950, pp. 14–15.
[8] Metal Bulletin (London), No. 3490, May 9, 1950, pp. 20–22
[9] Mining World, vol. 13, No. 4, April, 1951, p. 15.
[10] However, one of the remaining plants, the Clifton Junction works near Manchester was scheduled for reactivation early in 1951. (Ball, Maj. C. J. P., Magnesium, Lightest of the Light Alloys: Light Metals, vol. 14, No. 159, June 1951, pp. 329–334.)

Magnesium Compounds

By Joseph C. Arundale and F. M. Barsigian

GENERAL SUMMARY

DOMESTIC production of crude magnesite, as well as refractory magnesia and dead-burned dolomite, was greatly increased during 1950 as a result of expansions in the steel industry. Further expansions were being planned as a result of anticipated increases in steel-making capacity. Industrial activity, accelerated by the defense program, resulted in increased production of other magnesium compounds, such as the high-grade magnesias and magnesium chloride.

The assets of an important Austrian magnesite and refractories firm were acquired by a domestic concern.

TABLE 1.—Salient statistics of magnesite, magnesia, and dead-burned dolomite in the United States, 1946–50

	1946	1947	1948	1949	1950
Crude magnesite:					
Mined:					
Short tons	324, 640	375, 993	(1)	287, 315	429, 392
Value [2]	$2, 225, 850	$2, 596, 747	(1)	$1, 950, 153	$3, 091, 135
Caustic-calcined magnesia:					
Sold or used by producers: '					
Short tons	45, 178	26, 831	33, 209	32, 505	41, 447
Value	$2, 854, 538	$2, 508, 624	$3, 380, 528	$3, 109, 381	$4, 136, 898
Average per ton [3]	$63. 18	$93. 50	$101. 80	$95. 66	$99. 81
Refractory magnesia:					
Sold or used by producers:					
Short tons	244, 824	314, 921	330, 069	250, 389	335, 440
Value	$7, 231, 869	$10, 127, 585	$13, 444, 587	$10, 477, 856	$14, 915, 854
Average per ton [3]	$29. 54	$32. 16	$40. 73	$41. 85	$44. 47
Dead-burned dolomite:					
Sold by producers:					
Short tons	1, 007, 983	1, 395, 203	1, 544, 755	1, 318, 708	1, 759, 443
Value	$10, 101, 707	$14, 295, 359	$17, 847, 182	$15, 930, 226	$21, 725, 560

[1] Figure withheld to avoid disclosure of individual company operation.
[2] Partly estimated; most of crude is processed by mining companies, and very little enters open market.
[3] Average receipts f. o. b. mine shipping point.

DOMESTIC PRODUCTION

Magnesite.—Domestic production of 429,392 short tons of crude magnesite during 1950 was nearly 50 percent greater than the previous year and represented the largest tonnage since the war years 1943 and 1944. Refractory magnesia was produced at an all-time high. This greatly increased output was attributable mainly to the record production of basic steel, wherein the bulk of refractory magnesia is consumed, and to the construction of new basic open-hearth furnaces. The domestic steel industry consumed a record 106,610,273 long tons of iron ore during the year. Many firms producing refractory magnesia were making plans for greatly increased production in view of the steel industry's decision to increase steel-making capacity to 118,000,000 tons by 1953.

TABLE 2.—Magnesia sold or used by producers in the United States, 1949–50, by kinds and sources

Magnesia	From magnesite, brucite, and dolomite [1]		From well brines, raw sea water, and sea-water bitterns [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Caustic-calcined	8,992	$831,674	23,513	$2,277,707	32,505	$3,109,381
Refractory	175,364	6,763,294	75,025	3,714,562	250,389	10,477,856
Total	184,356	7,594,968	98,538	5,992,269	282,894	13,587,237
1950						
Caustic-calcined	6,418	740,369	35,029	3,396,529	41,447	4,136,898
Refractory	232,283	9,358,483	103,157	5,557,371	335,440	14,915,854
Total	238,701	10,098,852	138,186	8,953,900	376,887	19,052,752

[1] Magnesia made from a combination of dolomite and sea water is included with that from sea water.

Dolomite.—The intense activity in the steel industry was also reflected in increased sales of dead-burned dolomite and accounted for the bulk of the more than 1,750,000 tons sold in the United States during 1950. As in the case of magnesia, many firms producing dead-burned dolomite were implementing plans to greatly increase capacity. In view of the shortage of both magnesia and dead-burned dolomite, these expansion programs were stimulated and aided by the provisions of the Defense Production Act of 1950, particularly by accelerated tax-amortization provisions.

In a period when steel furnaces are being pushed to capacity and new hearths are being built, both refractory magnesia and dolomite are consumed at a greater rate per ton than normally. In addition, there is an over-all trend toward greater consumption of these basic refractories per ton of steel.

Additional information on dolomite may be found in the Stone and Lime chapters of this volume.

TABLE 3.—Dead-burned dolomite sold in and imported into the United States, 1945–50

Year	Sales of domestic		Imports [1]		Year	Sales of domestic		Imports [1]	
	Short tons	Value	Short tons [2]	Value		Short tons	Value	Short tons [2]	Value
1945	1,187,334	$10,613,711	(3)	$7	1948	1,544,755	$17,847,182	2,427	$91,613
1946	1,077,983	10,101,707			1949	1,318,708	15,930,226	1,851	72,680
1947	1,395,203	14,295,359	53	2,194	1950	1,759,443	21,725,560	2,127	86,425

[1] "Dead-burned" basic refractory material consisting chiefly of magnesia and lime.
[2] Includes weight of immediate container.
[3] Less than 0.5 ton.

Other Magnesium Compounds.—The high level of industrial activity was reflected in both production and sales of the light and heavy high-grade magnesias. A substantial increase in production of magnesium chloride was necessary to supply increased demand from the magnesium-metal industry.

TABLE 4.—Specified magnesium compounds produced, sold, and used by producers in the United States, 1949–50 [1]

Product [1]	Plants	Produced (short tons)	Sold [2]		Used (short tons)
			Short tons	Value	
1949					
Specified magnesias (basis 100 percent MgO), U. S. P. and technical:					
Extra-light and light	5	1,637	1,644	$837,751	----------
Heavy	3	933	949	395,994	(3)
Total	[4] 5	----------	2,593	1,233,745	(3)
Precipitated magnesium carbonate	10	55,925	7,273	924,299	48,641
1950					
Specified magnesias (basis 100 percent MgO), U. S. P. and technical:					
Extra-light and light	5	2,480	2,392	1,214,844	----------
Heavy	3	1,850	1,734	513,586	(3)
Total	[4] 5	----------	4,126	1,728,430	(3)
Precipitated magnesium carbonate	10	54,633	7,389	1,134,499	47,153

[1] In addition to the compounds shown, magnesium chloride, hydroxide, nitrate, phosphate (1950 only), and sulfate were produced. Figures for these items are withheld to avoid disclosure of individual company operations.
[2] Sales by a producer to an affiliated consumer for immediate use are not included with "Sold" but are with "Used."
[3] Figure withheld to avoid disclosure of individual company operations.
[4] A plant producing more than 1 grade is counted but once in arriving at total.

REVIEW BY STATES

California.—Johns-Manville Products Corp., 22 East Fortieth Street, New York 16, N. Y., produced magnesium carbonate from purchased magnesium hydroxide at Redwood City, Calif., for use in 85-percent magnesia insulation. Kaiser Aluminum & Chemical Corp., Kaiser Building, Oakland, Calif., operated its magnesia-from-sea-water plant at Moss Landing, producing refractory and caustic-calcined magnesias. Marine Magnesium Products Corp., South San Francisco, Calif., recovered precipitated magnesium carbonate, magnesium hydroxide, and specialty magnesias, using lime, dolomite, sea-water bitterns, and water from San Francisco Bay as raw materials. Pabco Products, Inc. (formerly The Paraffin Cos., Inc.), 1550 Powell Street, Emeryville 8, Calif., produced magnesium carbonate from purchased magnesium hydroxide for use in 85-percent magnesia insulation. Westvaco Chemical Division, Food Machinery & Chemical Corp., 405 Lexington Avenue, New York 17, N. Y., produced a small quantity of magnesite from its Western mine near Livermore, Calif., and reported that its calcining plant was idle during 1950. This firm also produced at its Newark plant refractory and caustic-calcined magnesia from sea-water bitterns and dolomite and caustic-calcined magnesia from magnesite. At its Chula Vista plant it recovered magnesium chloride from sea-water bitterns.

Illinois.—Johns-Manville Products Corp., 22 East Fortieth Street, New York 16, N. Y., produced precipitated magnesium carbonate by the Pattinson process at its Waukegan, Ill., plant for use in 85-percent magnesia insulation.

Michigan.—The Dow Chemical Co., Midland, Mich., produced magnesium chloride and epsom salt from well brines, dolomite, and lime. Michigan Chemical Corp., St. Louis, Mich., produced magnesium carbonate and magnesia from well brines and dolomite. The Morton Salt Co., 120 South LaSalle Street, Chicago 4, Ill., produced precipitated magnesium carbonate from well brines at its Manistee, Mich., plant. Standard Lime & Stone Co., 2000 First National Bank Building, Baltimore 3, Md., produced refractory-grade magnesia from well brines and lime at its plant at Manistee.

Nevada.—Basic Refractories, Inc., 845 Hanna Building, Cleveland, Ohio, produced magnesite and brucite at its operation near Gabbs, Nev. This material is processed into a line of refractories at its Maple Grove, Ohio, plant.

Sierra Magnesite Co., Box 8–A, Newark, Calif., produced magnesite from its Segerstrom mine near Gabbs, Nev. The Standard Slag Co., 1200 Wick Building, Youngstown, Ohio, produced magnesite from its mine near Gabbs, Nev., and reported for the first time sales of calcined material. Previously, this firm shipped only raw magnesite.

New Jersey.—The J. T. Baker Chemical Co., Phillipsburg, N. J., produced a line of magnesium compounds from purchased magnesium carbonate. Johns-Manville Corp., at its Manville plant, produced precipitated magnesium carbonate by the Pattinson process for use in 85-percent magnesia insulation. Northwest Magnesite Co., 1922 Farmers Bank Building, Pittsburgh 22, Pa., continued to recover refractory-grade magnesia from sea water and dolomite at its Cape May, N. J., plant.

Ohio.—The Diamond Alkali Co., Union Commerce Building, Cleveland, Ohio, produced refractory magnesia from dolomite at Fairport.

Pennsylvania.—Both Keasbey & Mattison Co., Ambler, Pa., and the Philip Carey Manufacturing Co., Cincinnati 15, Ohio (plant at Plymouth Meeting, Pa.), produced magnesia and magnesium carbonate. The Ehret Magnesia Manufacturing Co., Valley Forge, Pa., produced precipitated magnesium carbonate. All three firms used the Pattinson process, and the magnesium carbonate produced was for use in 85-percent magnesia insulation.

Texas.—The Dow Chemical Co., at Freeport, Tex., recovered magnesium chloride from raw sea water as an intermediate in the production of magnesium metal. It also produced some magnesia.

Washington.—The Laucks Chemical Co., 1008 Western Ave., Seattle 4, Wash., produced epsom salt from a natural deposit near Tonasket. Northwest Magnesite Co., 1922 Farmers Bank Building, Pittsburgh 22, Pa., the largest producer of natural magnesite in the United States, produced refractory magnesia near Chewelah.

West Virginia.—The Standard Lime & Stone Co., 2000 First National Bank Building, Baltimore 3, Md., produced a refractory magnesia from dolomite at its Millville, W. Va., plant.

PRICES

According to E&MJ Metal and Mineral Markets, the price of dead-burned grain magnesite per ton, f. o. b. Chewelah, Wash., rose in May to $33.00 in bulk and $38.00 in bags, increasing in October to $36.30 in bulk and $41.80 in bags, from $30.50 to $31.00 in bulk and $35.00 to $35.50 in bags, respectively, in 1949. The Westvaco Chemical Division of Food Machinery & Chemical Corp. quoted prices of its magnesias (carlots, f. o. b. California), late in the year as follows: Powdered caustic-calcined magnesite, in bags, $75; kiln-run 90-percent sea-water periclase remained at $50.50 per ton in bulk throughout the year.

According to the Oil, Paint and Drug Reporter, magnesium hydroxide, medicinal grade, was quoted at 29 to 30 cents per pound throughout the year. As for the past few years, magnesium carbonate, technical grade, bags, carlots, freight equalized, was quoted at 9 to 9½ cents per pound and magnesium carbonate, U. S. P. grade, at 10¾ to 11¼ cents. Magnesium carbonate is quoted freight allowed to New Jersey (except to Atlantic, Burlington, Cape May, Cumberland, Gloucester, Ocean, and Salem Counties) and to Philadelphia County, Pa. Freight was equalized with New York City on all other destinations. Magnesium chloride, flake, barrels, carlots, works, was increased to $45.00 per ton in July. Epsom salt, technical, bags, carlots, was quoted at $2.15 per 100 pounds throughout the year. Technical-grade calcined magnesia, cartons, works, was quoted at 32 to 34¾ cents per pound; synthetic, rubber grade, cartons, works, was 29 to 31 cents per pound; U. S. P. light, cartons, at 34 to 36 cents per pound; and U. S. P. heavy, barrels, at 36 to 38 cents per pound.

FOREIGN TRADE [1]

The domestic shortage of refractory magnesia accounted for sizable imports from Austria—the only important shipment from this country since before World War II. The small imports of magnesia from India and Canada shown in table 5 are principally high-grade periclase or electrical-grade magnesia.

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 5.—Magnesite imported for consumption in the United States, 1948–50, by countries

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
CRUDE MAGNESITE						
Brazil	----	----	----	----	2	$28
Canada	37	$4,372	----	----	----	----
Greece	----	----	----	----	1	22
India	59	1,037	----	----	----	----
Philippines	----	----	----	----	5	75
Total	96	5,409	----	----	8	125
LUMP CAUSTIC-CALCINED MAGNESITE						
Canada	17	$1,858	----	----	8	$467
Greece	11	596	----	----	----	----
India	713	24,824	568	$19,616	399	14,696
Netherlands	----	----	240	14,909	546	25,911
Yugoslavia	----	----	----	----	55	2,400
Total	741	27,278	808	34,525	1,008	43,474
GROUND CAUSTIC-CALCINED MAGNESITE						
Austria	----	----	----	----	6	$245
Canada	17	$1,862	1	$63	----	----
Greece	----	----	----	----	44	1,720
India	102	3,719	662	23,898	1,059	40,063
Netherlands	55	4,250	5	324	----	----
United Kingdom	7	1,375	8	1,108	9	1,247
Total	181	11,206	676	25,393	1,118	43,275
DEAD-BURNED AND GRAIN MAGNESITE AND PERICLASE						
Austria	(1)	$50	----	----	11,839	$622,927
British Guiana	58	5,680	----	----	----	----
Canada	2,984	292,107	1,369	$133,518	2,104	188,690
Czechoslovakia	----	----	1,102	48,000	----	----
Italy	----	----	----	----	177	6,009
Total	3,042	297,837	2,471	181,518	14,120	817,626

[1] Less than 0.5 ton.

TABLE 6.—Magnesium compounds imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Oxide or calcined magnesia		Magnesium carbonate, precipitated		Magnesium chloride (anhydrous and n. s. p. f.)		Magnesium sulfate (epsom salt)		Magnesium salts and compounds, n. s. p. f.[1]		Manufactures of carbonate of magnesia	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	50	$16,205	145	$23,428	38	$1,539	(2)	$2	11	$8,991	----	----
1947	(3)	20	136	34,799	3	348	(4)	5	6	4,335	----	----
1948	----	----	282	82,305	6	767	----	----	9	7,809	(5)	$49
1949	(6)	2	192	61,385	6	852	358	9,928	9	7,601	----	----
1950	----	----	234	51,043	8	835	1,962	45,233	158	24,851	3	1,479

[1] Includes magnesium silicofluoride or fluosilicate and calcined magnesium sulfate.
[2] 20 pounds. [3] 198 pounds. [4] 138 pounds. [5] 200 pounds. [6] 50 pounds.

TECHNOLOGY

European all-basic open-hearth furnace designs and general practices were investigated to determine if they suggest improvements in similar-type hearths in the United States. The results of this investigation were presented in considerable detail. It was concluded that improvement of some domestic practices, particularly in design of furnace port ends, may result from use of European techniques. In other instances, American techniques may improve results in European all-basic open hearth furnaces. Many of the designs and techniques on the other hand, are similar.[2]

Progress reports on all-basic furnaces in the United States and Canada were presented. Experience during the year indicated that the all-basic furnace had not as yet proved economically advantageous over the conventional silica-roof furnaces which is probably due to the cost of basic construction and high rate of fuel consumption.[3]

The performance of high-magnesia ramming mixes, a controversial subject during the past few years, was reviewed for one open-hearth shop.[4]

WORLD REVIEW

Austria.—The accompanying table shows that the Austrian magnesite industry is continuing to recover from the postwar slump and is increasing its output of magnesite. Increases will also be noted in Greece, Southern Rhodesia, Union of South Africa, and others.

The General Refractories Co. of Philadelphia, Pa., purchased all of the outstanding capital stock of the American-Austrian Magnesite Corp., which owns all of the stock of Austro-American Magnesite Co., which in turn owns and operates magnesite deposits and a refractory brick plant near Radenthein, Austria. Production from this operation is expected to be increased by the application of "American patents, processes, and know-how."[5]

In an agreement signed February 25, 1950, and effective March 1, 1950, valid for 1 year, magnesite bricks and other refractory products valued at $40,000 are given in list B, Austrian export goods for Greece.[6]

Magnesite and magnesite brick valued at 300,000 Swedish kronor are listed under Austrian export goods in a supplemental protocol to the Austro-Swedish agreement of April 2, 1948, made effective in Vienna December 19, 1949, extending the formal trade agreement between the two countries to December 31, 1950.[7]

---

[2] Heuer, R. P., and Fay, M. A., The All-Basic Open Hearth, European and American: Am. Inst. Min. and Met. Eng., Proc. Open-Hearth Conference, vol. 33, 1950, pp. 189–212.

[3] Yarotsky, M. F., Progress Report on All-Basic Furnace at South Works, Carnegie-Illinois Steel Corp.: Am. Inst. Min. and Met. Eng., Proc. Open-Hearth Conference, vol. 33, 1950, pp. 217–219.

Moore, A. K., Progress Report on All Basic Furnace at Steel Co. of Canada: Am. Inst. Min. and Met. Eng., Proc. Open-Hearth Conference, vol. 33, 1950, pp. 219–220.

[4] Smith, Rudolph, Performance of High-Magnesia Ramming Mixes: Am. Inst. Min. and Met. Eng., Proc. Open-Hearth Conference, vol. 33, 1950, pp. 242–244.

Smith, Rudolph, High-Magnesia-Content Ramming Mixes: Refractories Jour., No. 9, September 1950, pp. 364–367.

[5] Pit and Quarry, vol. 42, No. 11, May 1950, p. 164.

[6] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 1, July 1950, p. 39.

[7] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 2, August 1950, p. 43.

TABLE 7.—World production of magnesite, by countries,[1] 1944–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Argentina	----------	----------	(2)	(2)	(2)	(2)	(2)
Australia	32,213	23,453	22,386	37,402	32,962	34,129	[3] 1,858
Austria	480,500	93,200	95,400	223,200	405,600	520,500	543,817
Brazil	(2)	2,009	(2)	(2)	850	43,110	(2)
Cyprus (exports)	144	288	3	30	1	20	20
Czechoslovakia	----------	----------	----------	173,300	(2)	(2)	[4] 173,000
Egypt	50	50	----------	----------	----------	----------	----------
Germany: Federal Republic	[4,5] 20,000	(2)	(2)	(2)	(2)	11,264	(2)
Greece	950	1,650	4,500	13,700	12,168	17,090	26,256
India	42,609	28,793	45,394	52,363	49,103	92,018	(2)
Italy	1,490	494	613	1,691	1,002	456	200
Kenya	45	14	61	41	----------	10	181
Korea:							
North	157,745 (North and South)	22,581	(2)	(2)	(2)	(2)	(2)
South			----------	----------	----------	----------	----------
Mexico	----------	----------	[6] 4,618	(2)	(2)	(2)	(2)
New Zealand	105	113	380	368	549	568	(2)
Norway	1,554	1,744	1,174	1,710	1,740	1,100	(2)
Poland	(2)	(2)	(2)	3,802	(2)	(2)	(2)
Southern Rhodesia	5,125	4,278	3,824	5,321	5,722	7,640	8,615
Spain	5,269	7,626	10,761	5,394	9,897	6,691	7,632
Tanganyika (exports)	----------	----------	----------	----------	----------	----------	83
Turkey	797	743	100	890	3,621	6,370	450
Union of South Africa	5,433	7,079	7,003	8,415	10,660	10,487	11,782
United States	509,336	305,228	294,507	341,093	(7)	260,646	389,536
Venezuela	[4] 700	5,600	2,750	2,980	1,900	----------	1,400
Total (estimate)	2,000,000	1,200,000	1,200,000	1,600,000	1,800,000	1,900,000	2,150,000

[1] Unless otherwise stated, quantities in this table represent crude magnesite mined. In addition to countries listed, magnesite is also produced in Anglo-Egyptian Sudan, Canada, China, Cuba, U. S. S. R., and Yugoslavia, but data on tonnage of output are not available; estimates by senior author of chapter included in total.

The Canadian production was actually magnesitic dolomite and brucite, valued as follows: 1944: C$1,139,281; 1945: C$1,278,596; 1946: C$1,225,593; 1947: C$1,167,584; 1948: C$1,587,709; beginning in 1949 value includes magnesium metal: 1949: C$1,536,200; 1950: C$1,473,377.

[2] Data not available; estimate by senior author of chapter included in total.

[3] Excluding New South Wales and South Australia.

[4] Estimate.

[5] January to June, inclusive.

[6] Exports.

[7] Bureau of Mines not at liberty to publish figure; included in total.

France.—A decree dated December 10, 1949, authorizes the National Industrial Nitrogen Office (Office National Industriel de l'Azote) to increase its financial participation in the potash and magnesia mines of Boudigot.[8]

Greece.—As of July 10, 1950, barter premiums on "Groupe 1" ore exports included raw magnesite and listed premiums of 13,400 drachmas to the dollar and 27,100 drachmas to the pound sterling; premiums on "Groupe 2" ores, which include caustic and dead-burned magnesite, were 9,200 drachmas to the dollar and 18,850 drachmas to the pound sterling.[9]

Venezuela.—Although from the standpoint of exploitable reserves magnesite deposits in Venezuela have long been considered promising, production costs have made Venezuelan magnesite uncompetitive in world markets; and, with a relatively small domestic market, the industry has received little impetus in recent years. Indications are that output, all of which was from the Island of Margarita, State of

[8] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 1, January 1950, p. 41.

[9] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, p. 50.

Nueva Esparta, was negligible. Domestic outlets for magnesite are largely reported by requirements from the pharmaceutical industry.[10]

No systematic exploration of magnesite resources in Venezuela has ever been undertaken. Magnesite production, which began early in the 1900's, has been hampered continually by poor market demand locally as well as abroad. The total output of crude magnesite, from the beginning of operations until about 1923 when the workings were abandoned, approximates only 40,000 metric tons. Production was not resumed until 1943, when it was undertaken in deposits near Porlamar.[11]

[10] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 4, April 1950, p. 29.
[11] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 3, September 1950, p. 40.

Manganese

By Norwood B. Melcher

GENERAL SUMMARY

DEALERS and consumers of manganese ore in the United States in 1950 experienced a record year in both imports and consumption. Receipts rose for the second consecutive year and even exceeded those in 1946, when Russia was the main supplier, although less than 4 percent of the 1950 total was supplied by the Soviet Union. This record was made possible by expanding shipments from several of the usual suppliers of recent years, and only very small tonnages originating from new sources.

India established an all-time record high in shipments to the United States during the year. Receipts from India, most of which were metallurgical-grade ore, comprised 34 percent of the import total. This Indian ore averaged 47.5 percent Mn but contained rather high iron. Ore from Central Provinces was more suited for blending with the high-iron ores of South Africa than was the material from the other Provinces.

The Union of South Africa was the second-largest supplier in 1950, furnishing 26 percent of the United States import total. Reserves of manganese in the Union of South Africa are sufficient to permit large expansion in the shipments from that country; however, movement to the United States, as well as other countries, is hindered by shortage of transportation facilities, particularly railroad cars in the Union. Also, in 1950 some limitations were felt because of a shortage of ocean bottoms late in the year as a result of transportation demands of United Nations forces in the Far East.

Gold Coast provided some of the most desirable grades of metallurgical ore, being high in manganese and low in iron. Thus, this material is in demand for blending with the higher iron ores from South Africa and India. Gold Coast also provided the bulk of the total United States receipts of battery- and chemical-grade ores during the year. The oxide ore from Gold Coast is suitable as a natural ore in the manufacture of dry-cell batteries and is also used for many chemical purposes, including the production of hydroquinone, permanganates, fluxes, and dyes.

Receipts of ore from Cuba (general imports) increased 59 percent over 1949. Increased mining activity in Cuba, resulting from higher prices, caused a 26-percent increase in that country's production, which, at the end of the year, was at a rate of virtually 100,000 tons annually. Indications were that this rate would be expanded somewhat further in the future.

Mexican shipments dropped sharply during the year, owing to abandonment of certain operations as a result of high costs and the uncertainty of adequate rail-shipment facilities in Mexico.

TABLE 1.—Salient statistics of the manganese industry in the United States, 1946–50, gross weight in short tons

	1946	1947	1948	1949	1950
Manganese ore (35 percent or more Mn):					
Mine shipments:					
Metallurgical ore	134,381	125,428	119,828	110,928	122,944
Battery ore	[1] 8,295	6,189	10,845	14,983	11,507
Miscellaneous ore	[1] 959	10	427	224	
Total mine shipments	143,635	131,627	131,100	126,135	134,451
General imports	1,749,223	1,541,818	1,256,597	[2] 1,544,584	1,834,925
Consumption	1,136,687	1,419,131	1,538,398	1,360,042	1,650,429
Ferromanganese:					
Domestic production	491,973	614,626	647,617	577,345	719,680
Imports for consumption	32,130	81,307	98,220	65,014	109,948
Exports	2,951	20,168	19,696	6,627	580
Consumption	501,260	662,214	670,774	617,645	774,852
Spiegeleisen:					
Domestic production	111,696	134,329	112,610	78,167	42,375
Imports for consumption	321			1,737	8,595
Exports	7,513	305	51		363
Consumption	112,700	120,019	102,392	75,841	76,280

[1] A small quantity of miscellaneous ore is included with battery ore.
[2] Revised figure.

As the 1950 rate of imports was believed to be about the maximum that could be obtained from present facilities, the need for developing new deposits and sources of manganese became more and more pressing. The Interdepartmental Manganese Coordination Committee, mentioned in Manganese chapters for previous years, dissolved its activities during the summer, when it appeared that the need for this coordinated effort between industry and various interested Government agencies had accomplished the goals for which it had been created and that expanded production would now have to await the execution of the various long-term development programs. Belgian Congo and Brazil were expected to become increasingly important as foreign suppliers of manganese ore in the future as a result of these programs.

Expansion of mineral production in the United States was one of the purposes of the Defense Production Act of 1950, Public Law 774, 81st Congress, second session, approved September 8, 1950. This law provided for Government assistance in developing domestic mineral deposits through contracts for Government purchases at above-market prices, if necessary; provided for direct loans to finance new capacity when other means of financing were not available; and provided loans on a Government-industry-participation basis for exploration of areas geologically favorable for the discovery of new reserves. In the last program, later administrative determination resulted in Government participation, with regard to manganese, of 75 percent.

The only contract concerning manganese to be completed in 1950 was a purchase contract with Manganese, Inc., for production of high-grade sintered concentrates from the deposits of ore at the Three Kids Mine in Clark County, Nev. This contract, which was signed with the Emergency Procurement Service (General Services Administration), called for production to begin in the middle of 1952. By the end of 1950 several other applications had also been received by the Defense Minerals Administration, the agency set up to handle applications that affected minerals. These applications covered various types of possible Federal assistance, but none except the Manganese, Inc., application were finally acted upon in 1950. A fourth means of Government assistance, which, although ineffectual in 1950, became available after passage of the Defense Production Act, was a provision in the Internal Revenue Act of 1950, section 124A. This provided that companies engaged in defense production could, under certain circumstances, amortize new facilities as rapidly as in 5 years. Administrative determinations were made as to the extent of the investment that could be amortized on this basis according to individual circumstances.

Research on manganese took on a new impetus in 1950, much of the work being carried out by the Bureau of Mines. The most important projects were the planned construction of a 50-ton-per-day pilot plant at Boulder City, Nev., to treat and beneficiate low-grade ores from Artillery Peak, Ariz., and other low-grade ores, and the construction of an experimental blast furnace and pilot plant in Pittsburgh, Pa., to experiment with recovery of manganese from basic open-hearth slag. This latter project has fascinating possibilities for commercial production, inasmuch as the raw material used has previously been largely discarded, and as much as one-half of our domestic requirements for manganese could be satisfied through full-scale plants of this type. Both pilot-plant projects were made possible by the appropriation of $850,000 by the Congress late in the year.

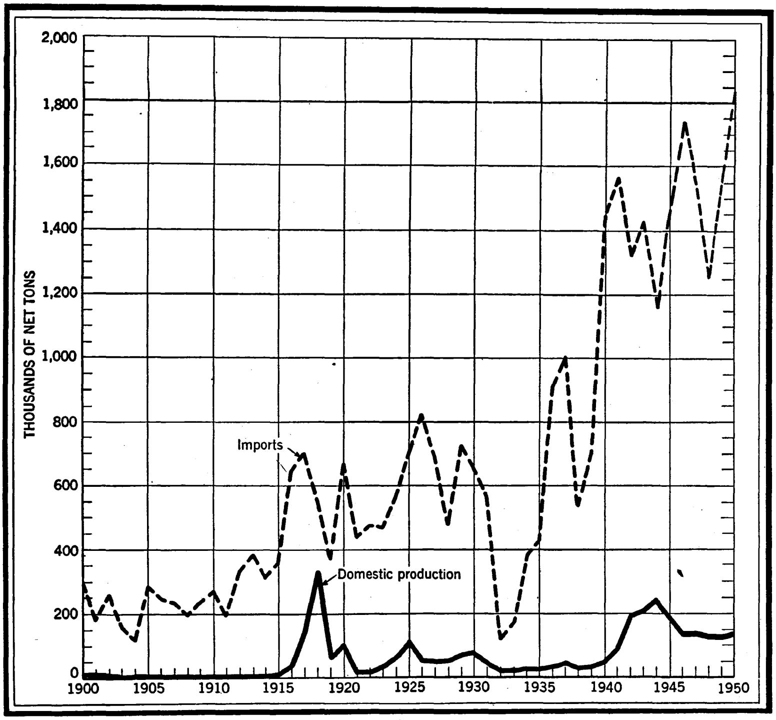

FIGURE 1.—General imports and domestic production (mine shipments) of manganese ore, 1900–50.

DOMESTIC PRODUCTION

Table 2 shows the various types of manganiferous materials shipped by domestic producers from 1946 to 1950.

TABLE 2.—Manganiferous raw materials shipped by producers in the United States, 1946–50, in short tons

Year	Metallurgical ore				Battery ore (25 percent or more Mn)	Miscellaneous ore	
	Manganese ore (35 percent or more Mn)	Ferruginous manganese ore (10 to 35 percent Mn)	Manganiferous iron ore (5 to 10 percent Mn)	Manganiferous zinc residuum		35 percent or more Mn	10 to 35 percent Mn
1946	134,381	100,402	1,070,694	205,786	[1] 8,295	[1] 959	87
1947	125,428	128,562	1,044,961	227,547	6,189	10	832
1948	119,828	139,580	1,198,523	291,383	10,845	427	2,462
1949	110,928	24,885	1,052,231	158,902	14,983	224	1,279
1950	122,944	115,269	972,328	183,842	11,507	------	------

[1] A small quantity of miscellaneous ore is included with battery ore.

Shipments of various grades of manganese-bearing ores during the last 5 years are given by States in tables 3 to 5. In addition, battery and miscellaneous ores were produced in Montana, and manganiferous zinc residuum was produced from New Jersey zinc ores.

TABLE 3.—Metallurgical manganese ore shipped from mines in the United States, 1946–50, by States, in short tons

State	1946	1947	1948	1949	1950	State	1946	1947	1948	1949	1950
Ala.	------	------	------	------	138	S. C.	78	------	------	------	------
Ariz.	------	133	240	223	222	Tenn.	------	39	37	175	133
Ark.	1,101	841	212	2,851	1,224	Utah	------	------	------	------	120
Calif.	------	------	------	280	37	Va.	321	------	------	------	56
Mont.	129,227	123,490	119,339	107,399	119,694	Wash.	1,424	------	------	------	------
Nev.	1,064	67	------	------	------						
N. Mex.	1,166	858	------	------	1,320	Total	134,381	125,428	119,828	110,928	122,944

TABLE 4.—Ferruginous manganese ore shipped from mines in the United States, 1946–50, by States, in short tons

State	1946	1947	1948	1949	1950	State	1946	1947	1948	1949	1950
Ariz.	------	62	------	------	------	Nev.	12,468	13,117	8,707	4,964	8,942
Ark.	1,964	2,094	1,165	5,555	6,359	N. Mex.	72,299	97,007	122,879	------	74,348
Calif.	------	------	------	386	640	Utah	7,903	7,198	2,694	4,981	1,964
Colo.	------	37	------	------	------	Va.	87	6,208	2,462	1,279	------
Mich.	1,952	------	------	------	------						
Minn.	------	------	------	3,482	16,206	Total	100,489	129,394	142,042	26,164	115,269
Mont.	3,816	3,671	4,135	5,517	6,810						

TABLE 5.—Manganiferous iron ore shipped from mines in the United States, 1946–50, by States, in short tons

State	1946	1947	1948	1949	1950
Michigan	------	------	------	------	117,619
Minnesota	1,070,694	1,044,961	1,198,523	986,720	853,632
New Mexico	------	------	------	65,511	------
Utah	------	------	------	------	1,077
Total	1,070,694	1,044,961	1,198,523	1,052,231	972,328

MINING BY STATES

Alabama.—Two operators in Cherokee and Calhoun Counties shipped manganese ore averaging (natural) 40 percent manganese.

Arizona.—The Denison Manganese Co. shipped manganese ore containing (natural) 43 percent manganese from the Long Valley mine in Coconino County, and the U. S. Manganese Corp. shipped a (natural) 47 percent ore from Gila County. The Federal Bureau of Mines continued the development project on the Artillery Peak manganese deposit. This work consists of driving underground workings and core drilling, along with sampling.

Arkansas.—Shipments of ore from Independence County were made by Denison Manganese Co. at (natural) 37 percent manganese, and the Westmoreland Manganese Co. shipped hand-sorted ore averaging (natural) 56 percent manganese. These companies also shipped ferruginous ore of (natural) 27 percent manganese.

California.—Four operators shipped (1) a small tonnage of manganese ore containing (natural) 49 percent manganese, and (2) ferruginous ore averaging (natural) 20 percent manganese from Humboldt, Riverside, and Siskiyou Counties.

Michigan.—Shipments of manganiferous iron containing (natural) 5 to 6 percent manganese were made from Iron County.

Minnesota.—The Hanna Coal & Ore Corp., Oliver Iron Mining Co., and Pickands, Mather & Co. shipped manganiferous iron ore from Crow Wing and St. Louis Counties averaging (natural) 6.2 percent manganese. Hanna also shipped 16,206 net tons of ferruginous ore containing (natural) 11 percent manganese.

Montana.—Montana continued to hold its position as the major producing State for manganese ore. Anaconda Copper Mining Co. produced crude ore from the Emma and Butte Hill mines in Silver Bow County and processed it into nodules containing (dry) 58.9 percent manganese, easily maintaining the position of the largest single producer of manganese ore in the United States. In Granite County of the Philipsburg district, the Trout Mining Division of the American Machine & Metals, Inc., shipped middlings averaging (natural) 22.7 percent manganese. Trout Mining Division and Taylor-Knapp Co. shipped 11,507 tons of battery-grade manganese ore averaging (natural) 42 percent manganese, or 66 percent MnO_2.

Nevada.—Eleven operators produced ferruginous ores averaging (natural) 27.4 percent manganese. The largest operator in Nevada was the Charleston Hill National Mines Co., which operated in Humboldt County. All ore was shipped to blast furnaces in Utah for consumption.

TABLE 6.—Manganese and manganiferous ores shipped from mines, in the United States in 1950, by States

	Metallurgical			Battery			Total			
	Shippers	Short tons: Gross weight	Short tons: Manganese content	Shippers	Short tons: Gross weight	Short tons: Manganese content	Shippers	Short tons: Gross weight	Short tons: Manganese content	Value
Manganese ore: [1]										
Alabama	2	138	54				2	138	54	(2)
Arizona	2	222	101				2	222	101	(2)
Arkansas	2	1,224	473				2	1,224	473	(2)
California	1	37	19				1	37	19	(2)
Montana	1	119,694	70,512	2	11,507	4,808	3	131,201	75,320	(2)
New Mexico	1	1,320	551				1	1,320	551	(2)
Tennessee	1	133	74				1	133	74	(2)
Utah	2	120	43				2	120	43	(2)
Virginia	1	56	25				1	56	25	(2)
Total	13	122,944	71,852	2	11,507	4,808	15	134,451	76,660	[3] $6,229,985
Ferruginous manganese ore: [4]										
Arkansas	2	6,359	1,667				2	6,359	1,667	(2)
California	3	640	137				3	640	137	5,766
Minnesota	1	16,206	1,789				1	16,206	1,789	(2)
Montana	1	6,810	1,546				1	6,810	1,546	(2)
Nevada	11	8,942	2,447				11	8,942	2,447	102,348
New Mexico	1	74,348	8,424				1	74,348	8,424	(2)
Utah	8	1,964	463				8	1,964	463	19,514
Total	27	115,269	16,473				27	115,269	16,473	669,332
Manganiferous iron ore: [5]										
Michigan	1	117,619	6,587				1	117,619	6,587	(6)
Minnesota	3	853,632	52,641				3	853,632	52,641	(6)
Utah	3	1,077	102				3	1,077	102	(6)
Total	7	972,328	59,330				7	972,328	59,330	3,940,100

[1] Containing 35 percent or more manganese (natural).
[2] Not available; estimate included in total.
[3] Estimate.
[4] Containing 10 to 35 percent manganese (natural).
[5] Containing 5 to 10 percent manganese (natural).
[6] Figure withheld in order to avoid disclosure of individual company operations.

New Mexico.—The Luck Mining & Construction Co. produced ferruginous ore from the Boston Hill mine in Grant County averaging (natural) 11.3 percent contained manganese. The Rock Products Co. produced manganese ore containing (natural) 42 percent manganese.

Tennessee.—The Hambright mine in Bradley County shipped concentrates averaging (natural) 55.4 percent manganese.

Utah.—Thirteen operators in Utah shipped manganese ore containing (natural) 35.5 percent manganese, ferruginous ore averaging (natural) 23.5 percent manganese, and manganiferous iron ore averaging (natural) 9.5 percent manganese.

Virginia.—The Glade Mountain mine in Smyth County shipped a small tonnage of manganese ore containing 44 percent manganese.

CONSUMPTION AND STOCKS

With expanding steel production during 1950 requiring more manganese ore, total consumption during the year exceeded that of the previous year by 21 percent. Domestic mines supplied 7 percent and foreign sources 93 percent, compared with 10 percent and 90 percent, respectively, in 1949. Two and one-half percent was consumed in the manufacture of dry cells, 1.5 percent went into chemicals, and 96 percent was used in the metals industry. Industrial stocks decreased from 928,349 tons on December 31, 1949, to 826,757 tons at the end of 1950, a decrease of 11 percent. A maldistribution of inventories, particularly in the lower iron grades, was apparent in 1949 and became more noticeable by the close of 1950.

TABLE 7.—Apparent consumption of manganiferous raw materials in the United States in 1950

	Ore containing 35 percent or more Mn		Ore and residuum containing 10 to 35 percent Mn		Ore containing 5 to 10 percent Mn	
	Short tons	Mn content (percent)	Short tons	Mn content (percent)	Short tons	Mn content (percent)
Domestic shipments	134,451	57.02	299,111	14.85	972,328	6.10
Imports for consumption	1,925,148	46.64	91,596	26.49	[1] 43,725	5.18
Total available for consumption	2,059,599	47.32	390,707	17.58	1,016,053	6.06

[1] Estimated from consumption.

Table 8 shows the actual tonnages of manganese ore containing 35 percent or more manganese (natural) and manganese alloys consumed during 1949 and 1950 by product for which consumed, together with stocks in consumers' hand at the end of the year.

TABLE 8.—Consumption of manganese ore and manganese alloys in the United States, 1949–50, and stocks Dec. 31, 1950, gross weight in short tons

Category of use and form in which consumed	Quantity consumed		In stock Dec. 31, 1950 [1]	
	1949	1950	At plant, including bonded warehouses	In bonded warehouses only
Manganese alloys and manganese metal:				
Manganese ore:				
Domestic	129,980	99,441	53,637	
Foreign	1,135,202	1,421,053	667,542	488,876
Total manganese ore	1,265,182	1,520,494	721,179	488,876
Ferromanganese			36,421	17,736
Spiegeleisen			3,818	
Silicomanganese			(2)	(2)
Manganese briquets			(2)	(2)
Steel ingots and steel castings: [3]				
Manganese ore:				
Domestic	1,196	2,667	593	
Foreign	2,542	858	541	
Total manganese ore	3,738	3,525	1,134	
Ferromanganese:				
High-carbon	559,084	688,972	111,489	
Medium-carbon } Low-carbon	28,306	50,731	9,669	
Total ferromanganese	587,390	739,703	121,158	
Spiegeleisen	57,693	59,573	30,482	
Silicomanganese	56,055	70,303	10,057	

For footnotes, see end of table.

TABLE 8.—Consumption of manganese ore and manganese alloys in the United States, 1949–50, and stocks Dec. 31, 1950, gross weight in short tons—Continued

Category of use and form in which consumed	Quantity consumed		In stock Dec. 31, 1950 [1]	
	1949	1950	At plant, including bonded warehouses	In bonded warehouses only
Steel castings: [4]				
Manganese ore:				
Domestic	35	210	271	----------
Foreign	491	477	835	----------
Total manganese ore	526	687	1,106	----------
Ferromanganese:				
High-carbon	19,157	23,703	6,945	----------
Medium-carbon } Low-carbon	1,051	1,399	439	----------
Total ferromanganese	20,208	25,102	7,384	----------
Spiegeleisen	8,182	6,741	1,562	----------
Silicomanganese	6,362	8,107	2,238	----------
Pig iron:				
Manganese ore:				
Domestic	210	2,049	561	----------
Foreign	39,476	57,079	63,082	----------
Total	39,686	59,128	63,643	----------
Dry cells:				
Manganese ore:				
Domestic	3,747	3,369	1,221	----------
Foreign	30,722	37,950	25,876	15,222
Total manganese ore	34,469	41,319	27,097	15,222
Chemicals:				
Manganese ore:				
Domestic	5,373	8,603	3,247	----------
Foreign	11,068	16,673	9,351	----------
Total manganese ore	16,441	25,276	12,598	----------
Miscellaneous products: [5]				
Ferromanganese:				
High-carbon	7,203	7,203	2,267	----------
Medium-carbon } Low-carbon	2,844	2,844	1,020	----------
Total ferromanganese	10,047	10,047	3,287	----------
Spiegeleisen	9,966	9,966	2,929	----------
Silicomanganese	910	910	289	----------
Manganese briquets	8,427	8,427	2,168	----------
Grand total:				
Manganese ore:				
Domestic	140,541	116,339	59,530	----------
Foreign	1,219,501	1,534,090	767,227	504,098
Total manganese ore	[6] 1,360,042	[6] 1,650,429	826,757	504,098
Ferromanganese:				
High-carbon	585,444	719,878	} 168,250	17,736
Medium-carbon } Low-carbon	32,201	54,974		
Total ferromanganese	617,645	774,852	168,250	17,736
Spiegeleisen	75,841	76,280	38,791	----------
Silicomanganese	63,327	79,320	[7] 12,584	----------
Manganese briquets	8,427	8,427	[7] 2,168	----------

[1] Excluding Government stocks.
[2] Data not available.
[3] Includes only that part of castings made by companies that also produce steel ingots.
[4] Excludes companies that produce both steel castings and steel ingots.
[5] Data for 1950 not available; 1949 figures carried over to show approximate magnitude of consumption and stocks.
[6] The greater part of the consumption of ore was used in the manufacture of ferromanganese and silicomanganese. Combining consumption of ore with that of ferromanganese and silicomanganese would result in duplication.
[7] Excludes small tonnages of producers' stocks.

The consumption of manganese (both in ferroalloy and directly charged ore) in 1950 per short ton of steel manufactured was 13.6 pounds compared to 13.2 pounds in 1949. This increase was in spite of efforts toward conservation and reflected particularly the expanded use of manganese in steels for defense uses. High-manganese steels used for defense purposes, such as armor plate, increase the consumption ratio of manganese considerably. Of the manganese used per ton of steel in 1950, 12.2 pounds was in the form of ferromanganese, 1.0 pound silicomanganese, 0.3 pound spiegeleisen, and 0.1 pound ore. These data apply to consumption of manganese in the manufacture of steel ingots and that part of steel castings manufactured by companies that also produce steel ingots. The companies reporting in this part of the survey are the same as those reporting production of ingots and castings to the American Iron and Steel Institute.

Electrolytic Manganese.—The Electro Manganese Corp., Knoxville, Tenn., was the only producer of electrolytic manganese during 1950.

TABLE 9.—Ferromanganese and spiegeleisen imported into and made from domestic and imported ores in the United States, 1949–50, in short tons

	1949		1950	
	Alloy	Manganese content	Alloy	Manganese content
Ferromanganese:				
Imported	65,014	52,167	109,948	87,493
Domestic production—Total	577,345	452,249	719,680	553,834
From domestic ore (estimated)	65,671	52,537	66,426	51,119
From imported ore (estimated)	511,674	399,712	653,254	502,715
Total	642,359	504,416	829,628	641,327
Ratio (percent) of Mn in ferromanganese of domestic origin to total Mn in ferromanganese made and imported		10.4		8.0
Number of plants making ferromanganese	10		14	
Spiegeleisen:				
Imported	1,737	313	8,595	[2] 1,719
Domestic production [1]	78,167	16,787	42,375	8,719
Total	79,904	17,100	50,970	10,438
Ratio (percent) of Mn in spiegeleisen of domestic origin to total Mn in spiegeleisen made and imported		98.17		83.53
Number of plants making spiegeleisen	4		4	
Total available supply of metallic manganese in ferromanganese and spiegeleisen		521,516		651,765
Percent of available supply of manganese in:				
Ferromanganese and spiegeleisen imported		10.06		13.69
Ferromanganese made from imported ore		76.64		77.13
Ferromanganese made from domestic ore		10.07		7.84
Spiegeleisen made from domestic ore		3.22		1.34
Ferromanganese and spiegeleisen made from domestic ore		13.29		9.18
Spiegeleisen made and imported		3.28		1.60
Open-hearth, bessemer, and electric steel produced	77,978,176		96,836,075	

[1] None produced from foreign ore.
[2] Estimated.

Ferromanganese.—Output of ferromanganese in the United States increased 25 percent to 719,680 short tons in 1950 compared with 577,345 tons in 1949. The following plants were active producers during the year: Bethlehem Steel Co., Johnstown, Pa.; Anaconda Copper Mining Co., Black Eagle and Anaconda, Mont.; the Electro Metallurgical Division of the Union Carbide & Carbon Corp., Ashtabula, Ohio, Alloy, W. Va., and Niagara Falls, N. Y.; E. J. Lavino & Co., Reusens, Va., and Sheridan, Pa.; Tennessee Coal, Iron & Railroad Co., Ensley, Ala; Carnegie-Illinois Steel Corp., Clairton, Duquesne, and Etna, Pa.; Tennessee Products & Chemical Corp., Chattanooga, Tenn.; and Sloss-Sheffield Steel & Iron Co., North Birmingham, Ala. Manganese ore consumed in the manufacture of ferromanganese totaled 1,416,803 short tons in 1950. Of this quantity, 7 percent was of domestic origin and 93 percent foreign. The domestic contribution in 1949 was 10 percent, and in 1948, 6 percent. The recovery of manganese from ore in making ferromanganese was 83.6 percent in 1950 compared with 83.3 percent in 1949 and 84.6 percent in 1948. Shipments of ferromanganese from producing furnaces in 1950 increased 31 percent in quantity and 34 percent in value from 1949. Table 12 gives shipments for 1945–50.

TABLE 10.—Ferromanganese produced in the United States and metalliferous materials consumed in its manufacture, 1946–50

Year	Ferromanganese produced			Materials consumed (short tons)			Manganese ore used per ton of ferromanganese made (short tons)
	Short tons	Manganese contained		Manganese ore (35 percent or more Mn, natural)		Iron and manganiferous iron ores	
		Percent	Short tons	Foreign	Domestic		
1946	491, 973	78. 69	387, 112	883, 383	80, 377	4, 829	1. 959
1947	614, 626	78. 67	483, 509	1, 075, 043	109, 987	1, 340	1. 928
1948	647, 617	78. 42	507, 843	1, 209, 249	78, 702	5, 930	1. 989
1949	577, 345	78. 33	452, 249	1, 054, 445	114, 924	2, 540	2. 025
1950	719, 680	76. 96	553, 834	1, 311, 421	105, 382	------------	1. 969

TABLE 11.—Manganese ore used in manufacture of ferromanganese in the United States, 1946–50, by source of ore

Source of ore	1946		1947		1948		1949		1950	
	Gross weight (short tons)	Mn content, natural (percent)	Gross weight (short tons)	Mn content, natural (percent)	Gross weight (short tons)	Mn content, natural (percent)	Gross weight (short tons)	Mn content, natural (percent)	Gross weight (short tons)	Mn content, natural (percent)
Domestic	80, 377	58. 66	109, 987	59. 53	78, 702	59. 26	114, 924	59. 13	105, 382	58. 02
Foreign:										
Africa	323, 225	47. 18	313, 027	47. 35	386, 503	46. 69	367, 339	46. 24	606, 248	46. 00
Brazil	161, 456	40. 98	139, 300	40. 49	159, 668	40. 81	138, 917	40. 76	128, 940	40. 82
Chile	2, 194	47. 45	8, 298	47. 23	5, 195	47. 91	3, 838	47. 78	7, 279	47. 68
Cuba	165, 951	46. 53	74, 102	44. 00	35, 328	42. 87	36, 344	38. 83	42, 893	39. 20
India	207, 769	48. 33	369, 101	49. 94	304, 607	47. 82	258, 372	46. 96	447, 749	48. 15
Mexico	22, 492	47. 23	33, 382	41. 16	40, 420	41. 79	27, 952	40. 81	25, 851	41. 48
Philippines	--------	-------	2, 196	51. 64	7, 763	46. 13	10, 922	45. 12	5, 036	46. 84
Turkey	--------	-------	--------	-------	--------	-------	--------	-------	2, 928	45. 97
U. S. S. R	296	44. 59	135, 637	47. 71	269, 765	46. 08	210, 761	44. 91	44, 497	43. 59
Grand total	963, 760	47. 23	1, 185, 030	48. 14	1, 287, 951	46. 61	1, 169, 369	46. 41	1, 416, 803	46. 77

TABLE 12.—Ferromanganese shipped from furnaces in the United States, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	610 376	$78, 907, 189	1948	659, 193	$90, 126, 657
1946	493, 808	61, 355, 778	1949	560, 180	86. 463, 708
1947	614, 647	79, 972, 673	1950	731, 421	116, 043, 055

Spiegeleisen.—Production of spiegeleisen in the United States continued to decline in 1950 to 42,375 short tons from 78,167 tons in 1949 and 112,610 tons in 1948. Shipments, however, rose 21 percent in quantity, and the value increased 30 percent.

Three companies produced spiegeleisen in four plants in 1950: New Jersey Zinc Co., Palmerton, Pa., Carnegie-Illinois Steel Corp., Clairton and Etna, Pa., and The Tennessee Coal, Iron & Railroad Co., Ensley, Ala. No foreign materials were reported used in the manufacture of spiegeleisen in 1950.

TABLE 13.—Spiegeleisen produced and shipped in the United States, 1945–50

Year	Produced (short tons)	Shipped from furnaces		Year	Produced (short tons)	Shipped from furnaces	
		Short tons	Value			Short tons	Value
1945	139, 039	157, 774	$5, 108, 144	1948	112, 610	108, 960	$5, 261, 650
1946	111, 696	114, 982	3, 793, 673	1949	78, 167	53, 888	2, 972, 653
1947	134, 329	124, 517	4, 980, 030	1950	42, 375	65, 163	3, 875, 823

Manganiferous Pig Iron.—Pig-iron furnaces used 902,110 tons of manganese-bearing ores containing (natural) over 5 percent manganese in 1950. Of the ore used, 708,401 tons was of domestic and 193,709 tons of foreign origin. Of the domestic material used, 622,864 tons contained (natural) 5 to 10 percent manganese, 83,488 tons contained 10 to 35 percent manganese, and 2,049 tons contained over 35 percent manganese. Of the foreign material used, 43,725 tons contained less than 10 percent manganese, 92,905 tons contained 10 to 35 percent manganese, and 57,079 tons contained over 35 percent manganese.

Battery and Miscellaneous Industries.—Manufacturers of dry cells used 41,319 short tons of manganese ore during 1950; of this total, 3,369 tons were of domestic and 37,950 tons of foreign origin. Chemical plants used 25,276 tons, of which 8,603 tons were domestic and 16,673 tons imported. All of the ore used contained (natural) over 35 percent manganese. The principal use of chemical ore is in the manufacture of manganese sulfate fertilizer and of hydroquinone for photographic use. Manganese ore for battery use should have a high content of available oxygen with minimum iron and be relatively free from such metals as arsenic, nickel, copper, and cobalt, which are electronegative to zinc. Preferably, battery manganese ore should be poorly crystallized and consist of the gamma oxide known as cryptomelane. Ore for chemical use, on the other hand, is usually predominantly pyrolusite.

TABLE 14.—Foreign ferruginous manganese ore and manganiferous iron ore consumed in the United States, 1947–50, in short tons

Source of ore	Ferruginous manganese ore				Manganiferous iron ore			
	1947	1948	1949	1950	1947	1948	1949	1950
Africa	--------	--------	4,673	2,034	44,227	24,074	67,466	43,725
Australia	--------	--------	--------	--------	1,558	--------	--------	--------
Egypt	--------	--------	--------	92,905	--------	--------	--------	--------
Mexico	--------	52	6	--------	--------	--------	--------	--------
Palestine	--------	10,376	--------	--------	--------	--------	--------	--------
Total	--------	10,428	4,679	94,939	45,785	24,074	67,466	43,725

PRICES

Manganese Ore.—Prices of manganese ore containing 48 percent manganese, as quoted by E&MJ Metal and Mineral Markets, ranged at the beginning of 1950 from 81.8 to 83.8 cents per long-ton unit, including duty c. i. f. eastern and southern ports. At the end of the year, prices ranged from 92 to 96 cents per unit, with duty to the account of the buyer. The long-ton unit upon which the price of manganese ore is based is 1 percent of a long ton (22.4 pounds) of contained manganese. Prices of chemical ore are given on a per ton basis, with a minimum requirement of manganese dioxide. A duty of one-fourth cent per pound of contained manganese was imposed on all ores imported in 1950, except those from Cuba and the Republic of the Philippines, which entered duty free.

Manganese Alloys.—The average value, f. o. b. producers' furnaces, for ferromanganese shipped during 1950 was $158.65 per short ton, compared with $154.35 in 1949. According to Iron Age, the selling price of ferromanganese in carlots at eastern centers rose from $173.40 per gross ton at the end of 1949 to $181.20 in December 1950; the average for the year was $174.48. The average value of spiegeleisen, f. o. b. domestic furnaces, was $59.48 per short ton compared with $55.16 in 1949; and the quoted price on a gross-ton basis, as given by Iron Age, rose from $65 at the end of 1949 to $70 at the close of the year. The average quoted price per gross ton was $63.13 in 1950.

FOREIGN TRADE [1]

Imports of all grades of manganese ore (battery, chemical, and metallurgical) are shown by countries in table 15. The data include imports of battery-grade ore totaling 85,311 short tons in 1950. Of this quantity, 63,464 tons came from Gold Coast, 8,705 tons from Cuba, 6,535 tons from French Morocco, 5,928 tons from Union of South Africa, 554 tons from Chile, and 125 tons from Mexico. It is known that these imports include some receipts of chemical ore, particularly those from Gold Coast. This ore averaged 53.9 percent manganese, or 85.2 percent MnO^{2}. Imports for consumption of battery ore totaled 67,832 short tons valued at $2,000,771 or $29.50 per short ton f. o. b. foreign ports. Of the total, Gold Coast supplied 44,016 tons valued at $1,293,831; Cuba (chemical), 8,705 tons, $276,984; French Morocco,

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 15.—Manganese ore (35 percent or more Mn) imported into the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	General imports [1] (short tons)				Imports for consumption [2]					
					Short tons				Value	
	Gross weight		Mn content		Gross weight		Mn content			
	1949	1950	1949	1950	1949	1950	1949	1950	1949	1950
Angola	8,314	13,124	4,320	6,813	4,696	15,200	2,466	7,907	$126,581	$417,809
Belgian Congo	3,304	5,942	1,692	2,885	6,492	2,081	3,191	1,031	131,424	57,792
Brazil	151,560	129,721	61,015	58,652	201,569	136,343	88,016	60,454	2,903,197	2,590,287
Canada		57		31		57		31		2,789
Chile	8,192	8,802	3,771	4,147	14,732	7,761	6,672	3,749	253,699	192,637
Cuba	[3] 60,871	96,917	[3] 27,338	44,105	[3] 60,871	96,917	[3] 27,338	44,105	[3] 1,303,485	2,613,047
France	200		100		200		100		59,078	
French Morocco	1,432	27,836	798	14,696	1,432	27,633	798	14,712	56,935	1,015,491
Germany	(4)		(4)		(4)		(4)		57	
Gold Coast	[3] 371,313	328,099	180,529	163,206	281,829	378,105	138,472	184,930	4,745,154	7,805,805
Greece		440		178		440		178		13,500
India	429,203	630,146	207,495	299,545	357,163	642,505	172,504	312,022	7,248,492	15,432,202
Iran		1		(4)		1		(4)		35
Mexico	60,265	38,845	26,559	17,334	53,566	34,546	23,770	15,445	1,434,913	913,969
Mozambique					572		283		9,246	
Peru		823		485		823		485		29,847
Philippines	14,144	6,073	6,944	2,663	14,144	6,073	6,944	2,663	309,205	140,260
Portugal		447		188						
Spanish Africa	6		3		6		3		125	
Turkey		5,675		3,120		1,075		473		26,000
Union of South Africa	354,265	475,316	153,613	204,599	275,572	510,025	122,169	218,115	4,021,893	7,867,928
U. S. S. R.	81,459	65,563	38,933	31,632	151,003	65,563	71,358	31,632	3,845,115	2,085,225
United Kingdom	56		31		56		31		12,824	
Western Portuguese Africa, n. e. s.		1,098		593						
Total	[3] 1,544,584	1,834,925	[3] 713,141	854,872	[3] 1,423,903	1,925,148	[3] 664,115	897,932	[3] 26,461,423	41,204,623

[1] Comprises ore received in the United States during year; part went into consumption, and remainder entered bonded warehouses.
[2] Comprises receipts during year for consumption and ore withdrawn from bonded warehouses during year (irrespective of time of importation).
[3] Revised figure.
[4] Less than 0.5 ton.

6,535 tons, $280,000; Union of South Africa, 5,928 tons, $72,048; India, 1,969 tons, $64,904; Chile, 554 tons, $10,084; and Mexico, 125 tons, $2,920.

Imports for consumption of ferromanganese in 1950 increased 69 percent over 1949; exports decreased 91 percent to only 580 tons. Exports of manganese ore and concentrates totaled 8,962 tons valued at $458,054.

TABLE 16.—Ferromanganese imported for consumption in the United States, 1948–50, by countries

[U. S. Department of Commerce]

Country	1948			1949			1950		
	Gross weight (short tons)	Mn content (short tons)	Value	Gross weight (short tons)	Mn content (short tons)	Value	Gross weight (short tons)	Mn content (short tons)	Value
Belgium-Luxembourg							215	170	$28,133
Canada	72,316	57,477	$9,957,681	32,526	25,783	$4,762,495	24,029	19,099	3,315,823
Chile							110	87	14,494
China				14	8	1,407			
France							19,965	15,533	2,578,054
Germany							110	95	26,636
Japan				11	11	2,543	622	504	80,467
Korea				56	45	4,670			
Norway	25,904	20,949	4,558,912	32,407	26,320	6,534,494	60,223	48,378	9,542,794
Sweden							50	45	11,160
U. S. S. R.							4,122	3,215	574,080
United Kingdom							58	45	12,464
Yugoslavia							444	322	53,670
Total	98,220	78,426	14,516,593	65,014	52,167	11,305,609	109,948	87,493	16,237,775

TABLE 17.—Spiegeleisen imported for consumption in the United States, 1944–50

[U. S. Department of Commerce]

Year	Short tons	Value	Year	Short tons	Value
1944	3,761	$153,032	1947–48		
1945	3,146	142,883	1949	1,737	$86,217
1946	321	17,512	1950	8,595	474,259

TABLE 18.—Ferromanganese exported from the United States, 1945–50

[U. S. Department of Commerce]

Year	Gross weight (short tons)	Value	Year	Gross weight (short tons)	Value
1945	836	$175,556	1948	19,696	$2,990,645
1946	2,951	381,194	1949	6,627	1,360,279
1947	20,168	2,811,653	1950	580	139,876

WORLD REVIEW

Table 19 shows, insofar as statistics are available, the world production of manganese ores from 1945 to 1950 and their average manganese content. Official statistics of the countries are used, supplemented by data from semiofficial and other sources.

TABLE 19.—World production of manganese ore, by countries, 1945–50, in metric tons

[Compiled by Pauline Roberts]

Country [1]	Percent Mn	1945	1946	1947	1948	1949	1950
North America:							
Canada (shipments)				204	3		(2)
Cuba	36-50+	198,247	130,764	50,397	29,073	62,503	[3] 78,903
Mexico	41-45	51,959	25,000	31,400	53,800	[4] 53,900	[4] 32,400
United States (shipments)	35+	165,412	130,303	119,409	118,931	114,427	121,974
South America:							
Argentina [5]	35-38	4,272	(2)	(2)	(2)	(2)	(2)
Brazil (exports)	38-50	244,649	149,149	142,092	141,253	149,896	[4] 162,600
Chile	40-50	7,445	20,538	19,352	22,119	27,756	24,523
Europe:							
Greece	60-62		15		(2)	1,150	(2)
Hungary	35-48	[6] 6,600	14,780	33,470	[4] 40,000	(2)	(2)
Italy	34-37	3,297	8,383	26,547	24,689	24,219	16,208
Portugal	35-45	8,114	5,932	2,444	280	508	798
Rumania	30-36	(2)	18,807	(2)	[4] 47,000	[4] 65,000	(2)
Spain	40+	24,889	29,589	22,428	18,525	18,651	[4] 17,000
Sweden	30+	18,036	12,594	10,697	8,417	[4] 10,850	(2)
Switzerland		2,757	(2)				
U. S. S. R. (estimate)	41-48	2,251,000	1,700,000	1,800,000	1,800,000	1,500,000	2,000,000
United Kingdom	30+	11,480					
Yugoslavia (estimate)	35	300	7,000	11,700	12,000	14,000	(2)
Asia:							
Burma (estimate)	35	762	(2)	(2)	(2)	(2)	(2)
China	41	16,400	[7] 9,600	20,000	[4] 22,000	(2)	(2)
India	47-52	213,963	256,975	458,274	534,316	656,190	[8] 679,163
Indonesia		7,112					
Japan	32-40	[8] 85,700	29,394	34,473	55,000	100,000	134,066
Malaya	30	2,540					
Philippines	35-48			3,375	25,565	26,288	29,867
Portuguese India	32-50+		(2)	[3] 100	6,503	11,197	20,144
Turkey	30-50	5,095	2,370	5,833	8,327	25,002	[4] 20,000
Africa:							
Angola	50		1,900	700	400	18,600	9,308
Belgian Congo	50+	3,215	12,231	17,646	12,765	12,247	16,990
Egypt	30+	47	25	29	59,919	138,568	152,169
French Morocco	32-50	44,458	57,990	114,290	214,412	233,830	287,265
Gold Coast (exports)[9]	50+	713,013	777,583	598,655	640,088	752,963	711,416
Southern Rhodesia					10	166	
Spanish Morocco	50				13	653	[4] 750
Tunisia	35-40			25			(2)
Union of South Africa	40-50	114,546	237,897	288,213	276,393	655,175	790,937
Oceania:							
Australia		1,000	1,407	1,804	3,502	13,299	[10] 14,689
Fiji					71	102	203
New Caledonia	48					2,100	1,842
New Zealand			408		533	310	(2)
Papua		174	44	83	(2)	[11] 69	(2)
Total (estimate)		4,240,000	3,700,000	3,900,000	4,200,000	4,800,000	5,500,000

[1] In addition to countries listed, Belgium, Bolivia, Bulgaria, Costa Rica, Eritrea, Germany, Indochina, Iran, and Korea have produced manganese ore; estimates for them are included in the totals. Czechoslovakia and Northern Rhodesia report production of manganese ore; but, as it has been ascertained that the product so reported averages less than 30 percent Mn and therefore would be considered ferruginous manganese ore under the classification used in this report, the output has not been included in this table.
[2] Data not available; estimate by author of chapter included in total.
[3] Exports.
[4] Estimate.
[5] Shipments by rail and river.
[6] June to December, inclusive.
[7] Incomplete data.
[8] Fiscal year ended March 31 of year following that stated.
[9] Dry weight.
[10] Excluding South Australia.
[11] Fiscal year ended June 30 of year stated.

Angola.—It was reported during the year that United States investors would raise the capital of Cie. du Manganese de l'Angola from 20 to 100 million escudos to make possible an increase in production to 5,000 tons monthly.[2] The total production of manganese ore in Angola during 1950 was 9,308 metric tons.

Australia.—Manganese ores were placed under Commonwealth export control in 1950 under provisions of the Customs Act.[3]

Belgian Congo.—A new company was formed in Brussels to develop the manganese-ore deposits of the Société Minière du Beceka. The new company is titled Minière Beceka—Manganese. Plans called for first exports by the close of 1951.[4]

Brazil.—The Bethlehem Steel Corp. continued development work on its properties in Amapa Territory with main efforts in surveying the location of the necessary railroad to the Amazon port of Macapa during 1950. Bethlehem is working under an agreement with a Brazilian firm, Industria e Commercio de Minerios (Icomi). A new firm is planned for the development and operation of the deposits; and of this firm, Bethlehem will own 49 percent and Icomi, 51 percent. Preliminary negotiations were carried on between Icomi and the International Bank for Reconstruction and Development, from which the company was seeking a $35,000,000 loan to be guaranteed by the Brazilian Government. Under the terms of the concession, production and shipment of material are to begin by the end of 1953; and, by contract, Icomi is required to build a 136-mile railroad from the mines to the port, provided 10,000,000 tons of ore are proved. This railroad will absorb the bulk of the capital investment.[5]

India.—At the forty-second annual general meeting of the Central Provinces Manganese Ore Co., Ltd., on June 1, 1950, H. R. Holmes, chairman, emphasized the need for mechanization in the manganese mines. He pointed to the South Tirodi mine, where most of the machinery had been installed so far and where production had been increased and costs were reported to be less than hand labor. He mentioned further that two holes have been drilled at the Balaghat mine, both of which intersected manganese ore. One of these holes cut the bed at a depth of 550 feet below the surface, with the high grade continuing to this depth. Mr. Holmes stated that, in view of the substantial tonnage that the Balaghat bed alone yields for each 100-foot depth, the quantity of ore remaining in the Balaghat district and in other deposits in the Central Provinces may well be assumed to be very large.[6]

New Caledonia.—Discovery of several new manganese deposits was reported in 1950.[7]

Norway.—A discovery of manganese in an inaccessible area in western Norway at Sauda near Stavanger was reported during the year.[8]

Quebec-Labrador.—The existence of commercial grades of manganese ore in the iron-ore concession areas in Quebec-Labrador was announced during 1950.[9] These manganese occurrences have been discussed briefly.[10]

---

[2] Mining World, vol. 12, No. 7, June 1950, p. 48.
[3] Mining World, vol. 12, No. 4, April 1950, p. 47.
[4] Metal Bulletin, London, No. 3502, June 23, 1950, p. 19.
[5] Iron Age, Bethlehem To Develop Brazilian Manganese; vol. 166, No. 7, Aug. 17, 1950, pp. 101–102.
[6] Mining Magazine, vol. 82, No. 6, June 1950, p. 48.
[7] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 2, February 1950, p. 23.
[8] Mining World, vol. 12, No. 1, January 1950, p. 52.
[9] Mining World, vol. 12, No. 2, February 1950, pp. 49–50.
[10] Melcher, N. B., Quebec-Labrador as a Future Supply of Iron Ore for the United States, Bureau of Mines Mineral Trade Notes, Spec. Suppl. 29 (to vol. 27, No. 4), October 1948, pp. 6–7.

Mercury

By Helena M. Meyer and Alethea W. Mitchell

GENERAL SUMMARY

THE mercury industry was featured in 1950 by near-record imports, by the highest consumption since the peak established in 1945, by the smallest domestic production by a substantial margin in the 100 years covered by the statistical record, and by a sharp reversal after midyear of the long-time downtrend in prices.

Import entries in 1950 were 46 percent below the high for 1949 and 18 percent less than in 1945 but were larger than any other year. The quantity brought into the United States in 1949 was largely for the National Stockpile, a factor that did not influence 1950 receipts. Spain and Italy supplied most of the imports in 1950--51 and 27 percent, respectively—whereas Italy alone dominated 1949 receipts, with 82 percent of the total. Yugoslavia and Mexico shipped important quantities to the United States in both years. Sweden, Netherlands, and Denmark are listed as sources of significant quantities in 1950; but these are not mercury-producing countries, and the metal involved, therefore, must represent reexports. Japan, which produces mercury but is normally a net importer, has shipped to the United States in the postwar period chiefly from stocks of imported metal; in 1950 only one-fourth as much mercury came into the United States from Japan as entered annually in the period 1947–49.

The expanded consumption of mercury in 1950 established a new peacetime high—23 percent above 1949 and 6 percent above the previous peacetime record for 1948. Construction of mercury boiler plants and of chlorine and caustic soda plants using mercury cells contributed to the high consumption rates indicated for 1948 and 1949, although strictly speaking, the metal so used is not dissipated and may readily be reclaimed and put to other use. Such nondissipative uses did not characterize consumption in 1950, and a larger part of the total for that year therefore will not be available for recovery. Uses accounting for most of the increased consumption in 1950 were electrical apparatus (including the mercury cell), 65 percent over 1949; antifouling paint, 86 percent; and pharmaceuticals, 74 percent, with smaller gains for most other items. Agricultural use was an exception to the general trend, dropping 3 percent.

Mercury was accumulated in 1950 for a new large chlorine and caustic soda plant at Saltville, Va., and the noteworthy increase in industrial stocks during 1950 is explained chiefly by provision for the new installation. Three additional, smaller, chlorine and caustic soda plants to use mercury were in the planning stage at the end of 1950.

Domestic production dropped to 46 percent of the small quantity for 1949 and was only 10 percent of the annual average for 1941–45. One large producer, the Mount Jackson mine, Sonoma County, Calif., was active throughout 1950, and a second, the Cordero mine, Humboldt County, Nev., closed on February 15. Ranking third in output was the Juniper mine, San Benito County, Calif. These three properties accounted for 90 percent of the total for the United States, and about 13 other properties contributed the remaining 10 percent.

TABLE 1.—Salient statistics of the mercury industry in the United States, 1941–45 (average) and 1946–50

[Flasks of 76 pounds]

	1941–45 (average)	1946	1947	1948	1949	1950
Production	43,229	25,348	23,244	14,388	9,930	4,535
Number of producing mines	139	51	37	20	23	16
Average price per flask: New York	$165.97	$98.24	$83.74	$76.49	$79.46	$81.26
Imports for consumption	36,531	13,894	13,008	31,951	103,141	56,080
Exports	1,022	907	884	526	577	447
Consumption	50,866	31,552	35,581	46,253	39,857	49,215

The expectation of increased consumption of mercury in the United States because of the outbreak of war in Korea, followed by the speeding up of defense mobilization in the United States; the low level of domestic mining in the United States; and the sharp acceleration of exports by the two chief mercury-producing countries to the United Kingdom, ranking second in the world in consumption, caused a drastic reversal of the downward trend of mercury prices after June.

By June 1950 the average quoted price per flask for mercury at New York had sunk to \$70–\$72, the lowest level since September 1935, in contrast to the general wholesale-price index of the Bureau of Labor Statistics which had more than doubled during the same period. The price rose 25 percent to \$87–\$90 by the end of the third quarter, continued upward at an accelerated pace in the fourth quarter to reach \$138–\$141 by the year end, and the uptrend was unchecked at that time. The domestic price advances followed the establishment of higher Spanish quotations.

Following the Korean incident it became evident that the accomplishment of mobilization objectives would create many supply-requirement problems with regard to strategic minerals, as well as other products. Mercury is classed as a strategic mineral, but because from a world standpoint supplies of this metal in the postwar period have been more than ample for all needs, the Government strategic stockpile objective for mercury became more nearly filled than that for almost any other mineral in this class. As a consequence of this relatively satisfactory defense position, mercury was low on the list of minerals likely to receive Government production-stimulation aid under provisions of the Defense Production Act of 1950, but also less likely to be subject to Government consumption limitation orders, such as were immediately required for metals like cobalt, copper, and others.

An outstanding feature of the international situation was the great expansion in the movement of mercury from Spain and Italy to the United Kingdom. Total imports into the United Kingdom were

54,199 flasks in 1950 compared with 18,823 in 1949 and with an annual average of 35,478 in 1935–38. In 1950, 14,317 flasks were reexported by the United Kingdom, compared with 3,904 in 1949, leaving 39,882 and 14,919 flasks, respectively, as new supply available for consumption. Britain's consumption has expanded because of defense mobilization, but speculation and stockpiling may have been additional factors in the noteworthy gain in mercury receipts from abroad.

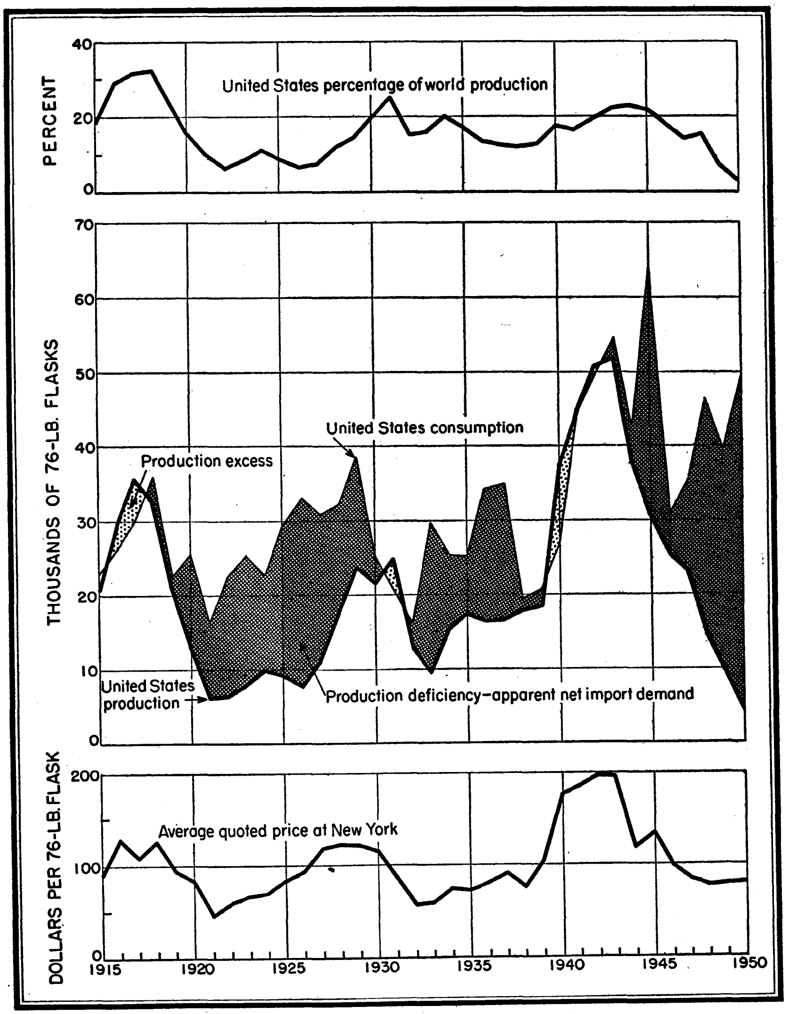

FIGURE 1.—Trends in production, consumption, and price of mercury, 1915–50.

Mercurio Europeo, the Spanish-Italian mercury cartel, was reported dissolved at the beginning of 1950 and to have been inoperative throughout the year. Consumers, however, were subjected to sales limitations and to violent price mark-ups and thus could note little, if any, benefit under the supposed free-market conditions.

DOMESTIC PRODUCTION

Only one large mercury mine, the Mount Jackson in Sonoma County, Calif., was productive throughout 1950, and total production for the United States was at the lowest level by far in the 100 years covered by production records. The Cordero mine, Humboldt County, Nev., which ranked first in output in 1949, closed February 15, 1950, and continued inactive for the remainder of the year. Although the rapidly advancing mercury price that followed the outbreak of war in Korea seemed to make possible the revival of sizeable domestic production, few properties, none large, resumed operations in the latter part of the year. Because of the adverse price movements of World War II, former operators took the position that assurances of the maintenance of a relatively favorable price were required to induce them to resume activity. According to spokesmen for the industry, the mines that contributed most of the mercury produced in World War II, other than the Mount Jackson, were in badly run-down condition. The reopening of inactive mines would require the expenditure of considerable funds, recruitment of technical and other help, the blocking out of ore reserves, and acquisition of the necessary equipment and supplies. Until confidence in the persistence of prices at profitable levels was reestablished, a major expansion in output was not to be expected.

Chief mercury-producing mines in 1950 were as follows:

California—San Benito County, Juniper, North Star, New Idria, and Aurora mines; Santa Clara County, New Almaden, Guadalupe, and New Almaden dumps; Sonoma County, Dewey-Geyser, Culver-Baer, and Mount Jackson (including Great Eastern) mines.

Nevada—Humboldt County, Cordero mine.

These 11 mines accounted for 99 percent of the United States total in 1950; in 1949, 7 mines produced 98 percent, but in 1942 it took 34 mines to furnish 89 percent.

TABLE 2.—Mercury produced in the United States, 1947–50, by States

Year and State	Producing mines	Flasks of 76 pounds	Value [1]	Year and State	Producing mines	Flasks of 76 pounds	Value [1]
1947:				1949:			
Alaska	1	127	$10,635	Alaska	1	100	$7,946
California	26	17,165	1,437,397	California	15	4,493	357,014
Idaho	1	886	74,194	Nevada	5	4,170	331,348
Nevada	6	3,881	324,995	Oregon	2	1,167	92,730
Oregon	3	1,185	99,232	Total	23	9,930	789,038
Total	37	23,244	1,946,453	1950:			
1948:				California	14	3,850	312,851
Alaska	1	100	7,649	Nevada	1	680	55,257
California	13	11,188	855,770	Oregon	1	5	406
Idaho	1	543	41,534	Total	16	4,535	368,514
Nevada	4	1,206	92,247				
Oregon	1	1,351	103,338				
Total	20	14,388	1,100,538				

[1] Value calculated at average price at New York.

TABLE 3.—Mercury produced in the United States, 1943–45, by months, and 1946–50, by quarters, in flasks of 76 pounds

Month	1943	1944	1945	1946	1947	1948	1949	1950
January	4,200	4,400	2,500					
February	3,900	3,800	2,700	5,550	6,100	5,300	1,440	1,700
March	4,600	3,800	3,000					
April	4,600	3,700	3,000					
May	4,200	3,400	3,300	7,000	5,700	3,600	1,460	1,010
June	4,100	3,000	3,000					
July	4,300	2,700	3,600					
August	4,500	2,500	3,300	6,500	5,850	3,150		1,100
September	4,500	2,500	2,050				6,980	
October	5,200	2,700	1,200					
November	5,000	2,300	1,350	6,150	5,550	2,050		630
December	4,200	2,500	1,600					
Total: Preliminary	53,300	37,300	30,600	25,200	23,200	14,100	9,880	4,440
Final	51,929	37,688	30,763	25,348	23,244	14,388	9,930	4,535

The long-time downtrend in grade of mercury ore treated in the United States was reversed in 1944–47, but subsequently has been resumed; in 1950 the average grade was 1 pound per ton lower than in 1949, which, in turn, averaged 2.2 pounds under that for 1947.

TABLE 4.—Mercury ore treated and mercury produced therefrom in the United States, 1927–50 [1]

[That material from old dumps which is not separable is included with ore]

Year	Ore treated (short tons)	Mercury produced: Flasks of 76 pounds	Mercury produced: Pounds per ton of ore	Year	Ore treated (short tons)	Mercury produced: Flasks of 76 pounds	Mercury produced: Pounds per ton of ore
1927	99,969	10,711	8.1	1939	191,892	18,505	7.3
1928	142,131	14,841	7.9	1940	449,940	37,264	6.3
1929	248,314	19,461	6.0	1941	652,141	43,873	5.1
1930	288,503	18,719	4.9	1942	733,360	49,066	5.1
1931	260,471	22,625	6.6	1943	613,111	50,761	6.3
1932	108,118	11,770	8.3	1944	300,385	37,333	9.4
1933	78,089	8,381	8.2	1945	209,009	29,754	10.8
1934	126,931	13,778	8.2	1946	157,469	24,929	12.0
1935	135,100	15,280	8.6	1947	139,311	22,823	12.5
1936	141,962	14,007	7.5	1948	103,220	13,891	10.2
1937	186,578	16,316	6.6	1949	71,977	9,745	10.3
1938	199,954	17,816	6.8	1950	35,115	4,312	9.3

[1] Excludes mercury produced from placer operations and from clean-up activity at furnaces and other plants.

In addition to the mercury produced at the mines in 1950, at least 2,000 flasks were reported as produced from old battery plates and other scrap, compared with 1,385 flasks in 1949 and 2,170 in 1948. Additional unreported quantities doubtless were recovered.

REVIEW BY STATES

Alaska.—No production of mercury was reported in 1950. The Decoursey Mountain mine, 24 miles from Crooked Creek, was the only producer from 1947 to 1949, inclusive.

The Bureau of Mines investigated the mercury deposits in the Cinnabar Creek area, Georgetown and Akiak districts, Kuskokwim region of southwestern Alaska, in 1947 and recently issued a report [1] on the subject.

[1] Rutledge, F. A., Investigation of Mercury Deposits, Cinnabar Creek Area, Georgetown and Akiak Districts, Kuskokwim Region, Southwestern Alaska: Bureau of Mines Rept. of Investigations 4719, 1950, 9 pp.

Arkansas.—No production has been reported since 1946. In 1944 the Bureau of Mines investigated 57 mine dumps, the calcine dumps of 13 furnaces, and 4 retorts to ascertain the possibility of recovering mercury from them. The measured mine dumps contained 144,000 tons of rock, of which 21,250 tons were estimated to contain 36,000 pounds or nearly 457 flasks. A report [2] on the investigation and results of the work carried on in the field by the Bureau in 1941 was recently issued.

California.—California resumed its normal position in 1950 by producing substantially more than all other areas in the United States together, as contrasted with the unusual situation in 1949 when for the first time in many years California accounted for less than half of the country's total. California produced 85 percent of the total in 1950, 45 percent in 1949, and 78 percent in 1948. Output of the Mount Jackson (including Great Eastern) mine, Sonoma County, dominated by a wide margin production in the State and in the United States. Thirteen other properties in California had some production in 1950, or a total of 14 compared with 15 in 1949. Production of six of the properties listed for 1950 was from clean-up or dump operations only. Output came from six counties as follows: Lake, Napa, San Benito, Santa Clara, Sonoma, and Yolo Counties.

A small quantity of mercury was recovered from clean-up operations at the Great Western mine, Lake County.

Mercury was reported to have been purchased from the Oat Hill mine, Napa County, and probably represented some clean-up or dump operation.

The Juniper mine, San Benito County, operated by Berg and Sciochetti, was the third largest producer in the United States, recovering 500 flasks of mercury in retorts. Clean-up operations at the New Idria mine resulted in production, and the North Star and Aurora mines also were productive. The North Star ore was handled in one of the furnaces at the New Idria mine, and that from Aurora was treated in its own retorts.

Small quantities of mercury were produced from dump ore at the New Almaden mine, Santa Clara County, from ore mined and retorted at the Guadalupe mine, and from one other property in the county. The Bureau of Mines released a report [3] on the Guadalupe mine and another [4] on the New Almaden mine during the year, and the Federal Geological Survey released one on exploration possibilities in the New Almaden mine.

The Mount Jackson (including Great Eastern), Sonoma County was by far the outstanding producer in California and in the United States. Two other properties in the county, the Culver-Baer and the Dewey-Geyser, also produced in 1950. At the Culver-Baer mine 25 flasks were recovered from 95 tons of ore treated in a 20-ton rotary furnace. A report [5] was published on the Skaggs Springs mine, idle since 1944.

---

[2] McElvenny, L. T., Smith, M. Clair, and McElwaine, Robert B., Investigation of Southwestern Arkansas Mercury District, Howard, Pike, and Clark Counties, Ark.: Bureau of Mines Rept. of Investigations 4737, 1950, 25 pp.

[3] Bedford, Robert H., and Ricker, Spangler, Investigation of Guadalupe Mercury Mine, Santa Clara County, Calif.: Bureau of Mines Rept. of Investigations 4682, 1950, 9 pp.

[4] Bedford, Robert H., and Ricker, Spangler, Investigation of the New Almaden Mercury Mine, Santa Clara County, Calif.: Bureau of Mines Rept. of Investigations 4697, 1950, 29 pp.

[5] Everhart, Donald L., Skaggs Springs Quicksilver Mine, Sonoma County, Calif.: California Jour. Mines and Geol., vol. 46, No. 3, July 1950, pp. 385–394.

The Altoona mine, Trinity County, which has been closed since 1945, was described.[6]

A small quantity of mercury was produced from soot at the Reed mine, Yolo County.

Nevada.—The Cordero mine, Humboldt County, was the second largest producer in the United States in 1950, having fallen from first place in 1949. Production in 1950 was up to February 15 only, when the mine was closed for the remainder of the year. No production was reported for any other property in Nevada in 1950.

Oregon.—The Amity mine, Crook County, was the source of a small quantity of mercury in 1950 and was the only property for which production in that year was reported.

Texas.—A *preliminary* report on the structural geology of the Terlingua quicksilver district was put on public file by the Federal Geological Survey in 1950.

CONSUMPTION AND USES

Consumption of mercury in 1950 was at a new peacetime peak rate, 23 percent above 1949 and 6 percent over the previous top in 1948; it was 21 percent below the all-time record established in 1945. Virtually all classifications, except agriculture, shared in the increased use in 1950. Agricultural consumption dropped 3 percent, following a 34-percent decrease in 1949, but this use had substantially more than doubled in the 2 years 1946 to 1948. The high rates of consumption in 1948 and 1949 were caused in part by chlorine and caustic soda and mercury-boiler installations, but no such construction contributed to the high total for 1950.

Electrical apparatus, including the mercury cell, was again by far the principal use, taking 65 percent more than in 1949. Other important classifications that made substantial gains in 1950 were pharmaceuticals, with an increase of 74 percent, and antifouling paint, with 86 percent.

TABLE 5.—Mercury consumed in the United States, 1946–50, in flasks of 76 pounds

Use	1946	1947	1948	1949	1950
Pharmaceuticals	4,095	3,047	3,382	3,443	5,996
Dental preparations	[1] 1,133	[1] 785	[1] 994	[1] 963	[1] 1,458
Fulminate for munitions and blasting caps	682	523	441	149	289
Agriculture	3,134	5,617	7,048	4,667	4,504
Antifouling paint	994	760	996	1,683	3,133
Electrolytic preparation of chlorine and caustic soda	550	693	806	755	1,309
Catalysts	3,310	5,078	3,262	2,520	2,743
Electrical apparatus	[1] 3,889	[1] 6,763	[1] 6,471	[1] 7,323	[1] 12,049
Industrial and control instruments	[1] 4,609	[1] 5,394	[1] 5,653	[1] 5,016	[1] 5,385
Amalgamation	99	138	143	165	192
General laboratory	269	333	442	345	646
Redistilled	[1] 5,574	[1] 4,689	[1] 6,499	[1] 6,642	[1] 7,600
Other	3,214	1,761	10,116	6,186	3,911
Total	31,552	35,581	46,253	39,857	49,215

[1] A partial breakdown of the "redistilled" classification showed 53 percent was for instruments, 14 percent for dental preparations, and 21 percent for electrical apparatus in 1950, compared with a range of 53 to 47, 22 to 10, and 22 to 10, respectively, in the 4-year period 1946–49.

[6] Swinney, C. Melvin, The Altoona Quicksilver Mine, Trinity County, Calif.: California Jour. Mines and Geol., vol. 46, No. 3, July 1950, pp. 395–404.

TABLE 6.—Mercury consumed in the United States, 1943–45, by months, and 1946–50, by quarters, in flasks of 76 pounds

Month	1943	1944	1945	1946	1947	1948	1949	1950
January	4,500	3,400	5,200					
February	4,700	3,700	5,100	6,800	9,000	10,000	10,400	10,600
March	4,900	3,600	6,100					
April	5,500	3,200	7,500					
May	5,600	3,100	8,900	8,100	8,500	15,700	7,600	11,300
June	4,700	3,400	8,500					
July	4,700	3,000	6,600					
August	4,900	3,900	5,300	7,400	7,700	9,400	8,000	12,400
September	4,100	3,900	3,100					
October	3,800	3,900	3,100					
November	3,900	3,900	2,500	8,900	9,900	10,300	13,900	15,300
December	3,200	3,900	2,000					
Total: Preliminary	54,500	42,900	63,900	31,200	35,100	45,400	39,900	49,600
Final			62,429	31,552	35,581	46,253	39,857	49,215

Mercury was accumulated in 1950 by the Mathieson Hydrocarbon Co. for a new large chlorine and caustic soda plant at Saltville, Va., which, according to a recent report,[7] was to begin operation in 1951 and have a daily capacity of 220 tons of caustic soda.

An article [8] describing a new 10-kw. short-arc mercury lamp, which may become a valuable asset in motion-picture studios and elsewhere, and another,[9] discussing mercury lamps for daylight signaling, were published. Compact-source lamps are said to have efficiencies of 50 to 60 lumens per watt available in powers up to 10 kw. By short-circuiting parts of the series ballast resistors the lamps may be flashed for brief periods at powers much greater than their normal ratings, and extremely high light outputs can then be produced. Color-corrected lamps for motion-picture studio lighting was the subject of another article.[10] In the new lamps color correction is obtained by means of metallic vapors in the discharge at considerably higher efficiency than heretofore—of the order of 50 lumens per watt for the 5,000-watt size. A water-cooled, high-pressure, mercury-discharge lamp, which has been used for motion-picture projection, was the subject of still another article.[11]

A summarized statement showing progress in mercury boiler-plant construction from 1928 when the first plant, the South Meadow Station, of the Hartford Electric Light Co., was installed, to 1949 when the plant, Schiller Station, of the Public Service Co. of New Hampshire, was completed, was released in 1950.[12] Other articles in the same magazine describe the newest installations in detail.

Organic mercury compounds generally have been accepted as the most efficient therapeutic agents for stimulating urine production,

[7] Chemical Engineering, Caustic Soda: Vol. 58, No. 1, January 1951, pp. 283–284, 286.
[8] Freeman, Geo. A., The Short-Arc Mercury Lamp: Westinghouse Eng., vol. 10, No. 2, March 1950, pp. 105–106.
[9] Bourne, H. K., and Beeson, E. J. G., Electric Discharge Lamps for Daylight Signaling: Engineering, vol. 169, No. 4395, Apr. 21, 1950, pp. 453–454.
[10] Illuminating Engineering, Color-Corrected Compact Mercury Lamps for Motion-Picture Studio Lighting: Vol. 45, No. 2, February 1950, pp. 105-106.
[11] Elenbaas, W. and van Heuven, E. W., Water-cooled, High-Pressure, Mercury-Discharge Lamp for Direct-Current Operation: Jour. of the Society of Motion Picture Engineers, vol. 53, No. 5, November 1949, pp. 594–597.
[12] The Mercury Power Plant From South Meadow, 1928, to Schiller, 1949: Power Generation, vol. 54, No. 3, March 1950, pp. 54–55.

according to an article published in the American Chemical Society Journal.[13]

The mercury cathode and its applications were described in a report published in 1950.[14] In summarizing, the authors state:

The mercury cathode cell is in use in several industrial and university laboratories where it is regarded as a valuable analytical tool, but it is by no means used as widely as it could be or should be. This rapid method is especially useful in the analysis of alloys and minerals wherein it is often necessary to remove large concentrations of one element in order to make possible the determination of a trace concentration of another by polarographic or other methods. In the field of rock analysis its use as a rapid method for the determination of the alkali and alkaline earth elements and for the separation of these elements one from another—always a troublesome problem—should be studied further. And there are interesting possible applications in the separation of elements such as copper, nickel, and chromium from the more abundant elements of rocks. Much ground must yet be tilled before an end to the applications of the mercury cathode cell is in sight, but the instrument is established as an integral part of the analytical laboratory.

STOCKS

Stocks of mercury in consumers' hands were at abnormally high levels in 1950, total industry inventories being 70 percent above those on hand at the beginning of the year. The accumulation of a large quantity of metal for use in a new chlorine and caustic soda plant was chiefly the cause of the sharp increase in 1950. If the new plant goes into operation in 1951, as anticipated, inventories should recede to more nearly normal levels. Noteworthy quantities of mercury are held in the National Stockpile, but data on such quantities may not be disclosed.

TABLE 7.—Stocks of mercury in hands of producers, consumers and dealers, and Office of Metals Reserve, 1946–50, in flasks of 76 pounds

End of year	Producers [1]	Consumers and dealers	Office of Metals Reserve	Total
1946	2,599	16,400	20,884	39,900
1947	3,084	16,200		19,284
1948	5,165	25,000		30,165
1949	5,354	15,600		20,954
1950	2,719	32,900		35,619

[1] Operators that account for roughly 95 percent of output.

PRICES

The price for mercury generally was downtrending from May 1945 through the second quarter of 1950, the chief exception being a $14-a-flask advance in December 1948 by the mercury cartel, Mercurio Europeo, which provided a temporary reversal. In June 1950 the price was at the lowest level since September 1935, an interim during which the Bureau of Labor Statistics general wholesale-price index had more than doubled. In July the price began to rise and moved forward thereafter without interruption to the end of the

[13] Rowland, R. L., Perry, Wendell L., Foreman, E. Leon, and Friedman, Harris L., Mercurial Diuretics. I. Addition of Mercuric Acetate to Allyl Urea: Jour. Amer. Chem. Soc., vol. 72, No. 8, August 1950, pp. 3595–3598.

[14] Maxwell, J. A. and Graham, R. P., The Mercury Cathode and Its Applications: Chem. Rev., vol. 46, No. 3, June 1950, pp. 471–498.

year, with the uptrend unchecked at that time. The quotation was $138–$141 a flask at the end of December or virtually double the lowest level of the year.

TABLE 8.—Average monthly prices per flask (76 pounds) of mercury at New York and London, and excess of New York price over London price, 1948–50

Month	1948			1949			1950		
	New York [1]	London [2]	Excess of New York over London	New York [1]	London [2]	Excess of New York over London	New York [1]	London [2]	Excess of New York over London
January	$78.31	$64.49	$13.82	$89.60	$73.57	$16.03	$71.00	$63.23	$7.77
February	76.41	64.50	11.91	88.09	74.08	14.01	71.00	52.93	18.07
March	76.00	64.50	11.50	87.30	74.58	12.72	71.00	52.93	18.07
April	75.46	64.50	10.96	84.65	74.56	10.09	71.00	52.16	18.84
May	74.16	63.69	10.47	82.20	74.56	7.64	70.35	49.42	20.93
June	76.00	60.47	15.53	80.27	74.53	5.74	70.00	47.68	22.32
July	75.42	60.47	14.95	78.16	74.55	3.61	73.44	47.26	26.18
August	75.00	60.47	14.53	74.56	74.53	.03	78.00	55.66	22.34
September	75.04	60.47	14.57	72.80	63.71	9.09	84.20	62.46	21.74
October	76.00	60.47	15.53	73.00	73.66	[3] .66	89.52	72.82	16.70
November	77.91	60.47	17.44	71.87	73.52	[3] 1.65	99.35	81.05	18.30
December	82.15	63.75	18.40	71.00	73.52	[3] 2.52	126.24	100.89	25.35
Average	76.49	62.35	14.14	79.46	73.28	6.18	81.26	61.94	19.32

[1] Engineering and Mining Journal, New York.
[2] Mining Journal (London) prices in terms of pounds sterling are converted to American dollars by using average rates of exchange recorded by Federal Reserve Board.
[3] London excess.

FOREIGN TRADE [15]

Receipts of mercury for consumption in the United States in 1950 dropped 46 percent below 1949, but except for that year and 1945 were the highest on record. The peak quantity in 1949 was influenced sharply by metal purchased for the National Stockpile (included in "imports for consumption" and "general imports") by the ECA with counterpart funds, and heavy imports in 1945 were in response to demand stimulated by World War II. The sharp rise in imports in the second half of 1950 was partly in response to increased needs for the defense mobilization program and partly speculative in character. Still greater defense demand was anticipated, and sources of supply were known to be limited.

Exports of mercury continued to be small in 1950, amounting to less than 1 percent of imports for consumption. Reexports again were larger than exports but were equivalent to only between 1 and 2 percent of total imports.

Imports.—Of the 56,080 flasks of mercury imported for consumption in 1950 (comparison with 1949 in parentheses), 28,462 (9,264) came from Spain, 14,973 (84,894) from Italy, 5,529 (3,176) from Yugoslavia, 3,480 (3,091) from Mexico, and 3,636 (2,716) from other countries. Of the other countries in 1950, only Japan (with 793 flasks) produced any mercury. Japan is not an exporter of mercury under usual conditions and in recent years has shipped heavily from

[15] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

stocks of imported metal. Normally importing countries such as Sweden, the United Kingdom, Netherlands, and Denmark appeared as sources of mercury imported into the United States in 1950; these shipments must have actually originated elsewhere. National and international conditions existing in the latter part of 1950 favored speculation, and doubtless this factor was present in some of the transactions in mercury that took place.

TABLE 9.—Mercury imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Country	1946		1947		1948	
	Pounds	Value	Pounds	Value	Pounds	Value
Canada	2	$6	3,801	$2,783	2	$4
Chile	28,064	27,978	20,536	17,504	----------	----------
Czechoslovakia	----------	----------	----------	----------	15,212	9,920
Italy	382,880	325,274	220,352	180,336	299,983	205,735
Japan	----------	----------	236,161	251,899	279,326	175,460
Mexico	407,334	378,235	135,521	103,015	265,140	179,266
Spain	237,676	201,783	265,843	201,766	1,473,137	931,201
Yugoslavia	----------	----------	106,400	71,400	95,448	65,273
Total: Pounds	1,055,956	933,276	988,614	828,703	2,428,248	1,566,859
Flasks	13,894	----------	13,008	----------	31,951	----------

Country	1949		1950	
	Pounds	Value	Pounds	Value
Canada	484	$319	8,105	$9,407
Denmark	----------	----------	22,818	20,103
Italy	6,451,947	5,830,409	1,137,975	738,217
Japan	205,894	142,772	60,277	35,222
Mexico	234,935	179,206	264,460	180,418
Netherlands	----------	----------	43,724	32,289
Spain	704,074	448,592	2,163,123	1,265,719
Sweden	----------	----------	80,619	64,441
United Kingdom	----------	----------	60,800	49,600
Yugoslavia	241,371	160,635	420,155	298,856
Total: Pounds	7,838,705	6,761,933	4,262,056	2,694,272
Flasks	103,141	----------	56,080	----------

General imports are a better measure of goods actually arriving in the country in a given period than are imports for consumption, which cover material entered for immediate consumption plus material withdrawn from warehouses for consumption. General imports were 60,564 flasks in 1950 (96,918 in 1949). Of the 1950 total 29,439 (2,225 in 1949) flasks came from Spain, 18,073 (84,628) from Italy, 5,980 (3,753) from Yugoslavia, 3,986 (3,506) from Mexico, and the remainder from Japan (793 in 1950 compared with 2,777 in 1949) and other countries that are normally mercury-importing countries.

Imports of mercury compounds generally are insignificant—those of mercuric chloride in 1950 were 1,102 pounds from Spain; of mercurous chloride, 5 pounds from the United Kingdom; of oxide (red precipitate), 150 pounds from the United Kingdom; and of mercury preparations not specifically provided for, 24,766 pounds, of which 24,557 were from Sweden and 209 from Belgium and Luxembourg.

Exports.—Of the exports of 447 flasks, 215 (64 in 1949) went to Canada, 70 (25) to Colombia, 43 (18) to Venezuela, 28 (32) to Brazil, 19 (10) to Mexico, 15 (24) to Cuba, and smaller quantities to 16 other countries.

TABLE 10.—Mercury exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Pounds	Flasks of 76 pounds	Value	Year	Pounds	Flasks of 76 pounds	Value
1946	68,932	907	$113,817	1949	43,860	577	$54,413
1947	67,148	884	90,659	1950	33,977	447	37,985
1948	40,013	526	42,620				

Reexports totaled 886 flasks (828 in 1949). Of the total, 578 (535) flasks went to Canada, 221 (108) to Brazil, 46 (73) to Colombia, and the remainder in quantities of 12 flasks or less to 8 other countries.

TABLE 11.—Mercury reexported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Pounds	Flasks of 76 pounds	Value	Year	Pounds	Flasks of 76 pounds	Value
1946	179,103	2,357	$192,899	1949	62,945	828	$53,057
1947	235,196	3,095	200,218	1950	67,311	886	63,839
1948	70,022	921	52,849				

WORLD REVIEW

World production of mercury is estimated to have increased about 18 percent in 1950, chiefly because of 55- and 20-percent gains in Spain and Italy; all other countries for which data are available had smaller outputs than in 1949. The year 1950 was characterized by noteworthy expansion in foreign trade between principal producing and consuming countries. Spanish exports were almost double production in that country; United Kingdom imports virtually trebled, and United States imports were the third highest on record. Spain withdrew from the Spanish-Italian cartel, Mercurio Europeo, at the beginning of 1950, and the cartel was reported to be inoperative throughout the year.

Mexico.—Following the establishment of an all-time peak output, 32,443 flasks, in 1942, production in Mexico has trended downward without interruption except in 1949. In 1950 only 11 percent as much metal was produced as in the record year. Exports of 4,960 flasks in 1950 and 6,469 in 1949 were above production in both years.

TABLE 12.—World production of mercury, by countries, 1942–50, in flasks of 34.5 kilograms (76 pounds) [1]

[Compiled by Viola May Haslacker]

Country [1]	1942	1943	1944	1945	1946	1947	1948	1949	1950
Algeria	121	146	165	326	340	346	381	102	(2)
Australia:									
New South Wales	(3)	--------	--------	--------	--------	--------	--------	--------	--------
Queensland	15	15	12	3	--------	--------	--------	--------	--------
Austria	(2)	(4)	(4)	(3)	(2)	(2)	(2)	5	(2)
Bolivia (exports)	--------	51	2	3	--------	--------	--------	--------	--------
Canada	13,630	22,240	9,682	--------	--------	--------	--------	--------	--------
Chile	2,256	2,563	1,181	862	827	445	467	754	(3)
China	4,293	3,133	3,510	1,828	1,189	290	290	(2)	(2)
Czechoslovakia	2,205	1,973	1,248	435	841	[5] 768	800	(2)	(2)
Germany	493	[6,7] 3,480	[6,7] 3,480	(2)	--------	(2)	(2)	(2)	(2)
Italy [8]	75,921	58,004	28,705	25,410	50,822	53,984	38,233	44,527	53,346
Japan	5,197	6,706	7,096	3,139	1,372	1,622	1,689	2,461	1,312
Mexico	32,443	28,321	26,063	16,443	11,661	9,700	4,786	5,250	3,713
New Zealand	150	93	90	30	--------	--------	--------	--------	(2)
Peru	145	326	152	209	5	--------	--------	--------	(2)
Rumania	21	176	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Southern Rhodesia	3	(3)	--------	(3)	--------	--------	--------	--------	--------
Spain	72,288	47,756	34,349	40,694	41,801	55,608	22,684	32,289	[7] 50,000
Sweden	11	--------	21	1	--------	--------	--------	--------	--------
Tunisia	3	(3)	--------	--------	--------	--------	--------	--------	--------
Turkey	271	186	97	158	--------	98	27	--------	(3)
Union of South Africa	579	1,189	1,192	852	764	--------	--------	--------	--------
United States	50,846	51,929	37,688	30,763	25,348	23,244	14,388	9,930	4,535
Total [7]	265,000	236,000	163,000	131,000	144,000	164,000	104,000	115,000	136,000

[1] Mercury is also produced in Korea, Yugoslavia, and U. S. S. R., but production data are not available; estimates by authors of chapter included in total.
[2] Data not yet available; estimates by authors of chapter included in totals.
[3] Less than 1 flask.
[4] Included with Germany.
[5] Byproduct of pyrites production in Slovakia only.
[6] Includes Austria.
[7] Estimate.
[8] Output of Idria mine (Yugoslavia) included with Italy through 1945.

Spain.—Mercury production was estimated as 50,000 flasks [16] in 1950 compared with 32,289 in 1949. Exports were 99,400 flasks in 1950, or about double production, and stocks thus were reduced sharply; at the end of 1950 stocks approximated 40,000 flasks. Spain withdrew from the Spanish-Italian mercury cartel, Mercurio Europeo, and the cartel was dissolved at the beginning of 1950. Thereafter the Spanish export price for mercury dropped from $70 to about $45 a flask. After the end of June the Spanish export price was advanced, on the average, every 2 or 3 weeks and was $130 a flask, f. o. b. Spanish port, at the year end when sales were restricted to small lots, not exceeding 250 flasks. Of the exports of 99,400 flasks in 1950 (27,620 flasks in 1949), the United Kingdom took 47 percent and the United States 35 percent.

No plant expansion took place in 1950, but plans were underway to make new installations in 1951.

[16] Data are taken from Annual Economic Report 1950, Counselor of Embassy for Economic Affairs, Madrid, Spain, Mar. 30, 1951, and Quarterly Mineral Reports.

United Kingdom.—The sharp advance in imports into the United Kingdom in 1950 was a dominant feature of the international mercury situation. Entries of 54,199 flasks in 1950 were virtually three times the 18,823 flasks for 1949, and about one and one-half times the prewar average for 1935–38. Reexports were 14,317 flasks in 1950 and 3,904 in 1949; the quantities available for consumption were 39,882 and 14,919 flasks, respectively, in the 2 years. Roura and Forgas of London was reported [17] to have been named sole selling agent in the sterling area for Italian quicksilver producers. This concern was to be represented in India and Ceylon by Khandelwals, Ltd., also of London.

[17] Metal Bulletin: No. 3484, Apr. 18, 1950, p. 15.

Mica

By Joseph C. Arundale and Nan C. Jensen

GENERAL SUMMARY

DOMESTIC production of sheet mica continued to supply only a small percentage of requirements. Production of ground mica increased sharply. There was a shortage of block and film mica, but supplies of both muscovite and phlogopite splittings were adequate, with the exception of book-form splittings. Prices of imported mica increased rapidly, and quality deteriorated.

The economic importance of pegmatites, from which all commercial sheet mica is derived, was discussed comprehensively in a publication issued by the Bureau of Mines.[1] In this publication it was pointed out that new knowledge regarding the internal structure of pegmatites has eliminated some of the guesswork in estimating reserves and forecasting costs of operation. Expanding markets for some of the major pegmatite products and greatly improved recovery methods also tend to reduce the hazards and uncertainties of soundly planned pegmatite operations.

A report was issued on an investigation of several pegmatites in the Black Hills district of South Dakota.[2] Over 2,000 feet of diamond-drill holes were completed, and much valuable information on these properties was acquired.

TABLE 1.—Salient statistics of the mica industry in the United States, 1946–50

	1946	1947	1948	1949	1950
Domestic mica sold or used by producers:					
Total uncut sheet and punch:					
Pounds	1,078,867	415,589	270,042	513,994	578,818
Value	$217,955	$116,110	$45,940	$132,097	$125,928
Average per pound	$0.20	$0.28	$0.17	$0.26	$0.22
Scrap (sales):					
Short tons	53,602	49,797	52,157	32,856	69,360
Value	$1,041,423	$1,095,578	$1,091,698	$795,782	$1,742,616
Average per ton	$19.43	$22.00	$20.93	$24.22	$25.12
Total sheet and scrap:					
Short tons	54,141	50,005	52,292	33,113	69,650
Value	$1,259,378	$1,211,688	$1,137,638	$927,879	$1,868,544
Total ground:					
Short tons	62,113	64,540	64,642	56,393	72,250
Value	$2,516,018	$2,967,713	$3,232,632	$2,860,956	$3,935,697
Consumption of splittings:					
Pounds	7,815,989	9,309,981	7,917,365	8,114,804	10,783,198
Value	$4,259,478	$6,680,753	$6,300,581	$7,096,365	$8,631,421
Imports for consumption ...... short tons	[1] 13,975	11,685	17,896	[1] 12,738	18,510
Exports ...... do	1,542	1,493	1,403	1,108	1,547

[1] Revised figure.

[1] Tyler, Paul M., Economic Importance of Pegmatites: Bureau of Mines Inf. Cir. 7550, 1950, 57 pp.
[2] Needham, A. B., Investigation of Mica Deposits at the White Bear, Silver Dollar, Buster Dike, and Hot Shot Mines, Custer County, S. Dak.: Bureau of Mines Rept. of Investigations 4693, 1950, 54 pp.

DOMESTIC PRODUCTION

Sheet Mica.—Domestic production of sheet mica increased slightly; but, as in the past, it represented only a small percentage of total sheet mica consumed. The great bulk of domestic sheet-mica production was in the punch and circle sizes. Mica is produced in the United States by a large number of small producers, many of which cannot be reached by the Bureau of Mines canvass of the industry. Therefore, it is necessary to depend largely on the reports by purchasers in compiling the statistics on domestic production. The principal reason for the small domestic production is the high cost of production rather than lack of deposits or reserves. The production, processing, and preparation of sheet mica require an unusual amount of hand labor, and in this respect domestic production cannot compete with mica produced in certain foreign countries with low-cost labor.

Despite the foregoing, there was a shortage of good-quality sheet mica in 1950, as well as of some of the other pegmatite minerals, and increased interest on the part of domestic producers and potential producers was noted.

Scrap Mica.—Sales of scrap mica to grinders in 1950 increased sharply to a new high of 69,360 short tons valued at $1,742,616, an 111-percent increase in tonnage and 119-percent in value over 1949. New production was reported from New Mexico, Arizona, Colorado, Georgia, and North Carolina, and many more projects were being considered.

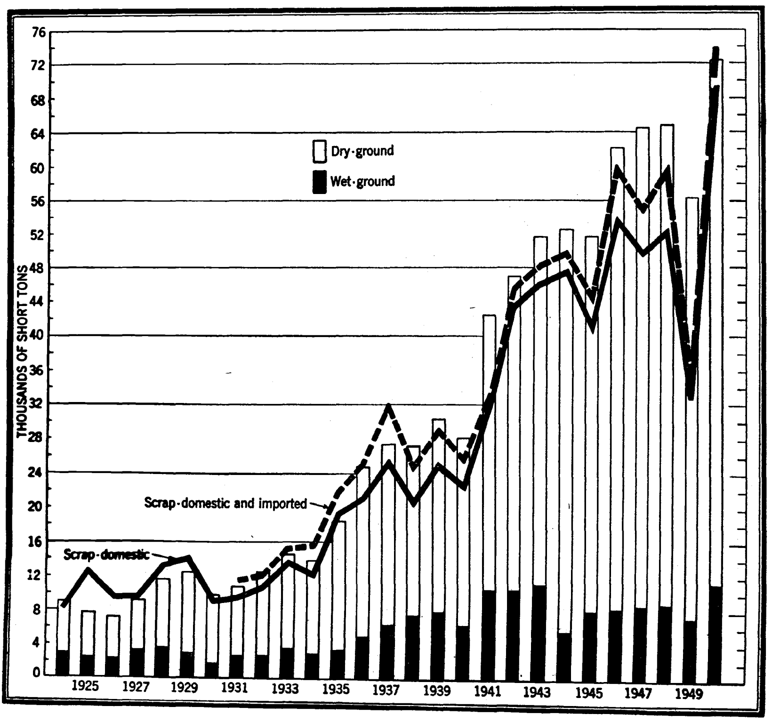

FIGURE 1.—Scrap and ground mica sold in the United States, 1924–50.

TABLE 2.—Mica sold or used by producers in the United States, 1935–39 (average) and 1943–50

Year	Sheet mica: Uncut punch and circle mica: Pounds	Sheet mica: Uncut punch and circle mica: Value	Sheet mica: Uncut mica larger than punch and circle: Pounds	Sheet mica: Uncut mica larger than punch and circle: Value	Sheet mica: Total uncut sheet mica [1]: Pounds	Sheet mica: Total uncut sheet mica [1]: Value	Scrap mica and mica recovered from kaolin and schists: Short tons	Scrap mica and mica recovered from kaolin and schists: Value	Total: Short tons	Total: Value
1935–39 (average)	888,313	$46,408	252,411	$139,306	1,140,724	$185,714	21,986	$285,512	22,557	$471,226
1943	2,691,083	473,955	757,116	2,754,787	3,448,199	3,228,742	46,138	738,025	47,862	3,966,767
1944	835,402	147,635	687,911	3,115,076	1,523,313	3,262,711	51,727	1,089,072	52,489	4,351,783
1945	1,166,858	166,116	131,729	571,226	1,298,587	737,342	41,060	812,322	41,709	1,549,664
1946	986,891	126,039	91,976	91,916	1,078,867	217,955	53,602	1,041,423	54,141	1,259,378
1947	343,832	47,099	71,757	69,011	415,589	116,110	49,797	1,095,578	50,005	1,211,688
1948:										
North Carolina	204,713	22,699	53,213	21,979	257,926	44,678	44,428	992,303	44,557	1,036,981
South Dakota	----------	----------	----------	----------	----------	----------	988	28,515	988	28,515
Other States [2]	12,081	1,229	35	33	12,116	1,262	6,741	70,880	6,747	72,142
Total	216,794	23,928	53,248	22,012	270,042	45,940	52,157	1,091,698	52,292	1,137,638
1949:										
North Carolina	410,630	67,117	59,442	54,153	470,072	121,270	24,801	640,374	25,036	761,644
South Dakota	7,206	846	1,161	2,542	8,367	3,388	1,125	31,285	1,129	34,673
Other States [2]	32,999	4,613	2,556	2,826	35,555	7,439	6,930	124,123	6,948	131,562
Total	450,835	72,576	63,159	59,521	513,994	132,097	32,856	795,782	33,113	927,879
1950:										
North Carolina	457,428	71,323	26,308	30,856	483,736	102,179	48,193	1,281,584	48,435	1,383,763
South Dakota	12,560	1,375	458	309	13,018	1,684	1,902	24,989	1,909	26,673
Other States [2]	76,445	13,977	5,619	8,088	82,064	22,065	19,265	436,043	19,306	458,108
Total	546,433	86,675	32,385	39,253	578,818	125,928	69,360	1,742,616	69,650	1,868,544

[1] Includes small quantities of splittings in certain years.
[2] Includes Arizona (1949–50), Colorado (1948–50), Connecticut (1948 and 1950), Georgia, Maine, New Hampshire (1948–50), New Mexico (1948 and 1950), New York (1950), Pennsylvania (1949–50), and Virginia (1949–50).

Ground Mica.—Sales of ground mica were the largest on record as this material gained increasing acceptance as a component of paints and for other uses. Producers were vigorously searching for new and expanded markets. The Wet Ground Mica Association, Inc., 420 Lexington Avenue, New York 17, N. Y., issued several pamphlets on the use of ground mica in paints.

TABLE 3.—*Scrap and reclaimed mica sold or used by producers in the United States, 1935–39 (average) and 1946–50*

	Scrap		Reclaimed [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1935–39 (average)	13,582	$168,688	8,404	$116,824	21,986	$285,512
1946	38,405	750,883	15,197	290,540	53,602	1,041,423
1947	35,199	709,745	14,598	385,833	49,797	1,095,578
1948	(2)	(2)	(2)	(2)	52,157	1,091,698
1949	24,942	526,268	7,914	269,514	32,856	795,782
1950	58,250	1,401,411	11,110	341,205	69,360	1,742,616

[1] Mica recovered from kaolin and mica schist.
[2] Bureau of Mines is not at liberty to distribute total because there are too few producers of reclaimed.

TABLE 4.—Ground mica (including mica from kaolin and schist) sold by producers in the United States, 1946–50, by methods of grinding

Year	Dry-ground		Wet-ground		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	53,908	$1,582,974	8,205	$933,044	62,113	$2,516,018
1947	55,731	1,852,768	8,809	1,114,945	64,540	2,967,713
1948	55,494	2,035,618	9,148	1,197,014	64,642	3,232,632
1949	49,133	1,850,400	7,260	1,010,556	56,393	2,860,956
1950	61,139	2,374,089	11,111	1,561,608	72,250	3,935,697

CONSUMPTION

Sheet, Punch, and Film Mica.—No accurate statistics on consumption of sheet, film, and punch mica are available; however, incomplete reports indicate that consumption increased substantially during 1950. Considerable difficulty was experienced in acquiring adequate quantities of both block and condenser film for the National Stockpile.

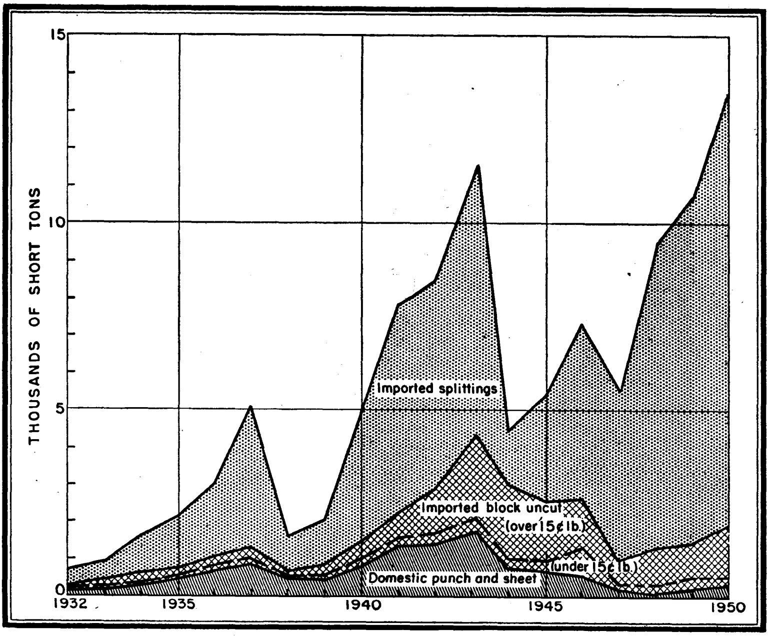

FIGURE 2.—Block mica and splittings imported for consumption in the United States and sales of domestic sheet and punch mica, 1932–50.

TABLE 5.—Production of sheet and punch mica and apparent consumption of sheet and punch mica and mica splittings in the United States, 1941–50, in pounds

Year	Production	Apparent consumption	Year	Production	Apparent consumption
1941	2,666,453	12,040,476	1946	1,078,867	[1] 13,287,337
1942	2,761,844	12,888,273	1947	415,589	11,302,644
1943	3,448,199	17,296,196	1948	270,042	11,009,970
1944	1,523,313	15,185,998	1949	513,994	[1] 11,005,987
1945	1,298,587	13,310,700	1950	578,818	14,623,425

[1] Revised figure.

Mica Splittings.—Consumption of mica splittings, as reported by consumers, reached an all-time high of nearly 11,000,000 pounds. Consumer stocks were near a normal and adequate level. Both muscovite and phlogopite splittings were acquired for the National Stockpile at an adequate rate, and the objective for both these items was nearing completion.

TABLE 6.—Consumption and stocks of mica splittings in the United States, 1946–50, by sources, as reported by consumers

	1946		1947		1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Consumption:										
Domestic	7,220	$1,651	81,800	$66,020	[1] 75,395	[1] $33,106	81,001	$45,767	[2] 200,728	[2] $105,717
Canadian	292,212	152,969	[3] 254,135	[3] 139,504	237,350	150,487				
Indian	7,243,835	3,939,595	8,424,625	6,074,465	7,228,660	5,866,441	7,462,101	6,624,447	9,847,591	8,032,918
Madagascan	217,309	130,040	549,421	400,764	375,960	250,547	571,702	426,151	734,879	492,786
Mexican	55,413	35,223	(3)	(3)	(1)	(1)	----------	----------	(2)	(2)
Total	7,815,989	4,259,478	9,309,981	6,680,753	7,917,365	6,300,581	8,114,804	7,096,365	10,783,198	8,631,421
Stocks in consumers' hands Dec. 31:										
Domestic	4,541	1,390	50,700	23,818	147,297	78,992	[2] 85,934	[2] 34,141	[2] 235,537	[2] 182,999
Canadian	275,685	166,786	[3] 110,162	[3] 64,561						
Indian	5,727,615	3,039,429	5,846,763	4,470,649	3,168,801	2,723,175	3,858,495	4,003,621	5,464,294	5,552,016
Madagascan	535,185	378,174	339,220	224,615	402,217	283,170	413,434	365,098	450,581	432,872
Mexican	45,906	29,952	(3)	(3)	----------	----------	(2)	(2)	(2)	(2)
Total	6,588,932	3,615,731	6,346,845	4,783,643	3,718,315	3,085,337	4,357,863	4,402,860	6,150,412	6,167,887

[1] Mexican included with domestic.
[2] Mexican included with domestic and Canadian.
[3] Mexican included with Canadian.

Built-Up Mica.—The production of more than 8,000,000 pounds of built-up mica in 1950 was the greatest output ever reported in a single year.

An important development affecting the built-up-mica industry was the reported plan of two domestic firms to make built-up-mica products from scrap mica, which in many instances would substitute for imported splittings.

TABLE 7.—Built-up mica produced in the United States, 1948–50, by kind of product

Product	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Molding plate	1,545,401	$2,435,709	1,579,846	$2,131,727	2,114,502	$3,860,049
Segment plate	2,008,924	3,614,521	1,727,212	3,041,809	2,548,442	4,928,870
Heater plate	1,033,995	2,126,367	1,033,035	1,965,678	898,333	2,416,478
Flexible (cold)	339,509	575,066	431,660	677,753	711,412	1,914,911
All other (tape, etc.)	1,020,989	3,792,278	1,523,515	5,386,887	1,773,912	7,120,539
Total	5,948,818	12,543,941	6,295,268	13,203,854	8,046,601	20,240,847

Ground Mica.—The market for ground mica during 1950 was good. The roofing industry took nearly half of the total output. The material used by this industry is usually the poorer quality and larger-mesh sizes. The paint industry consumed an increased percentage of the total, taking principally the better quality and finer-mesh sizes.

TABLE 8.—Ground mica (including mica from kaolin and schist) sold by producers in the United States to various industries, 1949–50

Industry	1949			1950		
	Short tons	Percent of total	Value	Short tons	Percent of total	Value
Roofing	29,481	52	$939,587	32,594	45	$1,083,584
Wallpaper	877	2	118,954	622	1	82,565
Rubber	3,856	7	378,411	5,776	8	580,840
Paint	8,484	15	620,306	14,386	20	1,102,524
Plastics	1,439	2	103,417	1,542	2	145,599
Miscellaneous [1]	12,256	22	700,281	17,330	24	940,585
Total	56,393	100	2,860,956	72,250	100	3,935,697

[1] Includes mica used for molded electric insulation, house insulation, Christmas-tree snow, manufacture of axle greases and oil, annealing, pipeline enamel, oil-well drilling, welding, and other purposes.

PRICES

Prices of domestic sheet mica increased during the year, but they still were not high enough to allow domestic producers in most instances to compete with the low-cost output from foreign sources. Quoted prices for domestic mica are nominal, vary greatly, and generally are determined by direct negotiation between buyer and seller after agreement as to the quality of particular lots. The following quotations from E&MJ Metal & Mineral Markets serve only as a general guide and represent a range of prices during 1950: North Carolina district, clear sheet, punch, 12 to 22 cents per pound, according to size and quality; sheet, 1½ by 2 inches, 70 to 75 cents per pound; 2 by 2 inches, $1.00 to $1.10; 2 by 3 inches, $1.40 to $1.50; 3 by 3 inches, $1.70 to $1.80; 3 by 4 inches, $2.10 to $2.20; 3 by 5 inches, $2.40 to $2.50; 4 by 6 inches, $3.15 to $3.25; 6 by 8 inches, $4.00 to $4.50; stained or electric mica was sold at approximately the same prices as clear sheet.

North Carolina wet-ground mica ranged from $120 to $135 per ton during 1950, depending on fineness and quantity; dry-ground, from $32.50 to $70; scrap, $30 to $35, depending on quality.

FOREIGN TRADE[3]

Imports.—In 1950 imports of mica of all types totaled 18,510 tons, compared with 12,738 tons in 1949. This was the largest tonnage of imports on record, and much of the increase was attributable to large tonnages of splittings acquired for the National Stockpile.

TABLE 9.—Mica imported into and exported from the United States in 1946–50

Year	Imports for consumption								Exports	
	Uncut sheet and punch		Scrap		Manufactured		Total		All classes	
	Pounds	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	[1] 4, 504, 672	[1] $2, 291, 062	6, 207	$75, 846	[1] 5, 515	[1] $4, 768, 554	[1] 13, 974	[1] $7, 135, 462	1, 542	$709, 109
1947	1, 754, 419	1, 150, 958	5, 109	66, 408	5, 699	6, 251, 613	11, 685	7, 468, 979	1, 493	970, 326
1948	2, 829, 335	2, 477, 598	7, 124	107, 540	9, 357	12, 960, 918	17, 896	15, 546, 056	1, 403	720, 359
1949	[1] 2, 466, 546	[1] 2, 111, 095	1, 758	21, 740	[1] 9, 747	[1] 17, 212, 419	[1] 12, 738	[1] 19, 345, 254	1, 108	676, 752
1950	3, 333, 762	3, 086, 969	4, 402	59, 014	12, 441	20, 506, 774	18, 510	23, 652, 757	1, 547	859, 796

[1] Revised figure.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 10.—Mica imported for consumption in the United States, 1946–49 [1] [2] (totals) and 1950, by kinds and by countries of origin

[U. S. Department of Commerce]

Country	Unmanufactured									
	Waste and scrap, valued not more than 5 cents per pound				Untrimmed phlogopite mica from which no rectangular piece exceeding in size 1 by 2 inches may be cut		Other			
	Phlogopite		Other				Valued not above 15 cents per pound n. e. s.		Valued above 15 cents per pound	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1946	4, 081, 171	$31, 929	8, 333, 916	$43, 917	341, 866	$56, 951	1, 504, 877	$183, 917	[1] 2, 657, 929	[1] $2,050,194
1947	3, 229, 691	23, 355	6, 987, 900	43, 053	305, 688	57, 066	186, 631	21, 149	1, 262, 100	1, 072, 743
1948	4, 834, 354	38, 046	9, 414, 366	69, 494	434, 429	77, 167	330, 455	35, 354	2, 064, 451	2, 365, 077
1949	981, 156	5, 658	2, 534, 919	16, 082	28, 304	4, 238	[2] 635, 313	[2] 94, 182	1, 802, 929	2, 012, 675
1950:										
Angola									19, 459	60, 030
Argentina							330, 606	28, 902	308, 359	155, 403
Brazil			2, 874	118			58, 423	7, 383	1, 212, 469	1, 025, 956
British East Africa									32, 177	44, 500
Canada	672, 700	5, 210	500, 200	3, 075	129, 400	21, 755	23, 475	2, 731	67, 146	79, 169
Ceylon			140, 800	915						
French Morocco			310, 496	2, 718						
India	112, 000	673	5, 442, 849	32, 578			16, 765	2, 368	955, 279	1, 550, 620
Italy									500	383
Madagascar									5, 047	11, 787
Mexico			283, 111	2, 213					9, 545	15, 112
Mozambique									6, 220	1, 669
Norway									203	112
Peru									1, 700	1, 179
Southern Rhodesia	111, 700	1, 105	432, 274	3, 772					104, 596	49, 933
Union of South Africa			795, 922	6, 637					17, 241	9, 719
United Kingdom									35, 152	18, 258
Total	896, 400	6, 988	7, 908, 526	52, 026	129, 400	21, 755	429, 269	41, 384	2, 775, 093	3, 023, 830

For footnotes, see end of table.

TABLE 10.—Mica imported for consumption in the United States, 1946–49 [1] [2] (totals) and 1950, by kinds and by countries of origin—Continued

Country	Manufactured—films and splittings							
	Not cut or stamped to dimensions				Cut or stamped to dimensions		Total films and splittings	
	Not above 12/10,000 of an inch in thickness		Over 12/10,000 of an inch in thickness					
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1946	[1] 9,434,097	[1] $3,918,855	404,066	$566,571	[1] 10,962	[1] $54,391	[1] 9,849,125	[1] $4,539,817
1947	9,075,818	5,460,243	467,548	611,995	11,128	39,714	9,554,494	6,111,952
1948	16,148,048	12,231,738	367,052	417,931	28,905	63,220	16,544,005	12,712,889
1949	[2] 18,402,145	[2] 16,208,432	447,884	701,346	18,722	154,641	[2] 18,868,751	[2] 17,064,419
1950:								
Brazil	7,337	13,550	483,325	376,663	3,833	15,205	494,495	405,418
Canada			50	273			50	273
France	6,019	4,541					6,019	4,541
Germany					913	14,697	913	14,697
India	22,136,319	17,844,095	594,032	1,102,297	3,815	42,455	22,734,166	18,988,847
Japan					21	322	21	322
Madagascar	907,696	495,178					907,696	495,178
Mexico	3,968	2,287	6,756	15,306	9,435	110,467	20,159	128,060
Switzerland	2,400	6,291					2,400	6,291
Union of South Africa	15,432	5,800					15,432	5,800
United Kingdom	7,158	16,225	5,919	11,288	9,782	179,951	22,859	207,464
Total	23,086,329	18,387,967	1,090,082	1,505,827	27,799	363,097	24,204,210	20,256,891

Country	Manufactured—cut or stamped to dimensions, shape, or form		Manufactured—other					
			Mica plates and built-up mica		All mica manufactures of which mica is the component material of chief value		Ground or pulverized	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1946	372,052	$203,491	1,000	$430	830	$1,288	806,791	$23,528
1947	131,776	103,118			1,976	3,128	1,710,090	33,415
1948	162,540	161,917	3,053	2,139	25,698	33,204	1,978,960	50,769
1949	81,551	102,083	4,002	11,989	5,247	16,935	533,833	16,993
1950:								
Argentina					62	242		
Australia					100	23		
Brazil	50,005	73,233	3,527	13,882	20,910	75,102		
Canada	700	1,040	253	502	437	1,144	560,000	25,814
Germany			102	157				
India	12,645	17,795	400	664	5	485		
Mexico	18,998	20,061	5,035	9,483	3,621	7,918		
United Kingdom	5	7	462	931	455	1,400		
Total	82,353	112,136	9,779	25,619	25,590	86,314	560,000	25,814

[1] Changes in Minerals Yearbook, 1946, p. 793, should read as follows: Unmanufactured (other), valued above 15 cents per pound—Argentina, 452,872 pounds ($285,882) and India, 873,201 pounds ($802,576). Manufactured (films and splittings): Not cut or stamped to dimensions and not above 12/10,000 inch in thickness—India, 8,891,367 pounds ($3,669,226); cut or stamped to dimensions—India, 8,498 pounds ($23,089). total—India, 9,273,176 pounds ($4,200,630).

[2] Changes in Minerals Yearbook, 1949, p. 780, should read as follows: Unmanufactured (other), valued not above 15 cents per pound—Brazil, 126,179 pounds ($40,386). Manufactured (films and splittings): Not cut or stamped to dimensions and not above 12/10,000 of an inch in thickness—India, 17,539,492 pounds ($15,715,840) and United Kingdom, 25,881 pounds ($13,203); total—India, 17,749,715 pounds ($16,278,767) and United Kingdom, 29,484 pounds ($85,480).

Exports.—Total exports of mica and mica products in 1950 increased by 40 percent in quantity and 27 percent in value over 1949. The greatest increases in the quantity of exports were in shipments of unmanufactured mica to Canada, and Belgium-Luxembourg; ground or pulverized mica to the same countries and Germany; and mica products other than ground or pulverized mica to Canada and Mexico.

TABLE 11.—Mica and manufactures of mica exported from the United States, 1946–49 (totals) and 1950, by countries of destination

[U. S. Department of Commerce]

Country	Unmanufactured		Manufactured			
			Ground or pulverized		Other	
	Pounds	Value	Pounds	Value	Pounds	Value
1946	295,081	$16,793	2,303,385	$101,820	485,963	$590,496
1947	330,900	76,695	2,343,657	129,091	311,097	764,540
1948	338,768	68,632	2,268,403	124,926	198,063	526,801
1949	113,776	43,140	1,922,179	102,147	180,157	531,465
1950:						
North America:						
Canada	194,189	15,137	1,118,123	54,202	131,261	451,492
Cuba			23,000	655	2,919	8,452
Dominican Republic					750	823
Guatemala			5,968	471	118	245
Mexico	59,227	19,280	71,000	2,760	21,513	35,197
Netherlands Antilles					52	613
Other North America					29	214
South America:						
Argentina					791	1,796
Brazil	174	287	72,000	3,203	1,375	5,617
Chile	90	157			4,316	10,369
Colombia			4,240	376	2,456	5,312
Peru			2,200	176	1,682	2,607
Uruguay					1,004	4,374
Venezuela			189,113	14,024	803	1,336
Europe:						
Austria					2,609	20,301
Belgium-Luxembourg	60,130	2,213	270,100	21,936	338	714
France			59,603	4,967	35	305
Germany	2,200	3,718	438,085	35,592		
Greece					406	2,464
Italy			61,500	4,970	10	111
Netherlands			32,100	2,628	4,107	8,861
Norway					364	647
Portugal			5,000	355	1,210	1,701
Spain	15	175	5,500	371	120	1,410
Sweden			42,425	2,867		
Switzerland			24,200	1,730		
United Kingdom	7,500	21,512				
Other Europe					15	170
Asia:						
China					1,200	2,240
India	12,075	35,174	3,000	205	4	190
Indonesia			15,650	1,286	3,199	4,579
Israel					2,790	7,787
Kuwait			45,000	2,210		
Taiwan					2,552	7,524
Philippines	60	418			50	111
Other Asia					146	330
Africa:						
Belgian Congo					263	1,577
Egypt					52	766
Union of South Africa	281	543	72,800	3,464	1,379	11,630
Oceania:						
French Pacific Islands					157	370
New Zealand			7,200	499		
Total	335,941	98,614	2,567,807	158,947	190,075	602,235

TECHNOLOGY

Research continued on the synthesis of mica, and some progress was reported; however, sheets of mica with physical characteristics comparable with the natural mica have not yet been produced.

WORLD REVIEW

India.—One of the most significant aspects of the mica situation during 1950 was the reduced export of splittings to the United States in the latter part of the year, which was due principally to decreased requirements for the National Stockpile. This condition and the possibility of substitutes for built-up mica made from splittings are expected to have an unstabilizing influence on the Indian mica industry.

In January the International Standards Organization met at New Delhi to discuss proposed new mica standards. It was reported that an agreement had been reached.[4]

Discovery of an extensive new mica deposit near Bhuvaneshwar was reported.[5]

Austria.—Austria is the only country in Europe that has produced substantial quantities of mica, all of which came from the St. Leonhard mine in Carinthia in the British Zone. The mine was last operated in August 1948. In the past, it has produced phlogopite at the rate of a few hundred tons a year. Although the property, developed by the Berlin office of the Philips Co. during the war, is under British Property Control jurisdiction, the British have announced that it will be restituted to the Netherlands. Philips Co. also has prospecting rights to a considerable area in the vicinity of the mine. Total production of crude mica from this mine from 1942 to 1948 was 549 metric tons.[6]

[4] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 3, March 1950, pp. 39–40.
[5] Mining World, vol. 12, No. 5, May 1950, p. 48.
[6] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 5, May 1950, pp. 38–41.

TABLE 12.—World production of mica by countries,[1] 1944–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1944	1945	1946	1947	1948	1949	1950
North America:							
Canada (sales)	3,032	3,195	3,955	3,773	3,584	1,583	1,634
Guatemala [2]	1	1	4	--------	--------	--------	--------
Mexico (exports)	111	409	81	231	(3)	(3)	(3)
United States (sold or used by producers):							
Block	691	589	489	189	122	233	262
Scrap	46,926	37,249	48,627	45,175	47,316	29,806	62,922
South America:							
Argentina	594	719	430	(3)	(3)	[4] 273	[4] 308
Bolivia (exports)	2	--------	--------	--------	--------	(3)	(3)
Brazil	1,217	1,016	1,639	1,226	1,898	[4] 558	(3)
Peru	113	491	207	2	--------	--------	(3)
Uruguay	3	--------	6	14	2	2	1
Europe:							
Austria	(3)	(3)	36	78	95	253	368
Italy	15	42	52	16	23	(3)	(3)
Norway (exports)	724	564	224	169	241	113	571
Portugal	2,505	--------	--------	3	--------	--------	(3)
Spain	239	18	4	12	11	9	14
Sweden	335	126	69	155	64	61	(3)
Asia:							
Ceylon	2	1	(5)	(5)	--------	--------	--------
India (exports)	3,670	4,859	10,675	9,788	18,384	13,743	15,874
Korea:							
North	405	95	(3)	(3)	(3)	(3)	(3)
South	44		--------	--------	--------	--------	
Africa:							
Angola	4	20	31	89	108	57	24
Eritrea	(3)	--------	(3)	3	(5)	(5)	(3)
French Morocco	--------	--------	5	--------	144	54	82
Kenya	(5)	(3)	--------	--------	(3)	4	6
Madagascar	493	620	468	450	507	959	802
Mozambique	4	2	2	1	1	103	40
Northern Rhodesia	16	7	(5)	--------	--------	3	2
Southern Rhodesia	250	196	335	296	293	303	407
Tanganyika (exports)	128	250	342	71	75	99	136
Uganda	12	6	(5)	--------	2	2	(3)
Union of South Africa	1,127	1,131	1,785	2,008	1,362	1,066	1,371
Oceania:							
Australia	144	158	229	371	427	736	[6] 450
New Zealand	(5)	(5)	--------	--------	--------	--------	(3)
Total (estimate) [1]	71,000	60,000	80,000	77,000	87,000	64,000	100,000

[1] In addition to countries listed, mica is also produced in China, Colombia, Ethiopia, Rumania, and U. S. S. R., but data on production are not available; estimates for these countries are included in total.
[2] Imports into United States.
[3] Data not available; estimate by senior author of chapter included in total.
[4] Exports.
[5] Less than 1 ton.
[6] Estimate.

Molybdenum

By Robert W. Geehan

GENERAL SUMMARY

PRODUCTION, shipments, exports, and consumption of molybdenum concentrates were higher in 1950 than in any of the preceding 4 years. Production increased in each quarter-year period, starting with the last quarter of 1949, the major increase being in the third quarter of 1950. Consumption of concentrates reversed the steady downward trend of 1949 and increased from 3,758,000 pounds in the last quarter of 1949 to 8,408,000 pounds in the last quarter of 1950. The major increase took place in the last 3 months of 1950. Shipments for export of molybdic oxide, calcium molybdate, and ferromolybdenum were up 49 percent; production increased 29 percent. As a consequence of the increased demand for molybdenum products in 1950, the quantity of concentrates converted to oxide was 30 percent greater than in 1949.

Production and shipments of molybdenum concentrates were higher by 26 and 91 percent, respectively, in 1950 than in 1949. Utah advanced from second to first place as a molybdenum-producing State, and replaced Colorado, which dropped to second.

Industry stocks of molybdenum concentrates were 79 percent less at the end of 1950 than at the close of 1949, and stocks of molybdenum products held by producers were 86 percent less.

Effective December 1, 1950, the quoted price of molybdenum in concentrates advanced 10 cents a pound, and the prices of products advanced at the same time.

TABLE 1.—Salient statistics of molybdenum concentrates in the United States, 1946–50

	Molybdenum contained, thousands of pounds				
	1946	1947	1948	1949	1950
Production	18, 218	27, 047	26, 706	22, 530	28, 480
Shipments (including exports)	16, 787	22, 190	29, 669	23, 280	44, 544
Exports [1]	565	2, 989	4, 132	5, 320	6, 235
Imports for consumption [2]	(3)	----------	----------	48	3
Consumption	14, 994	20, 221	25, 156	19, 960	26, 029
Stocks (Industry), Dec. 31 [4]	19, 275	23, 661	21, 206	19, 159	4, 090

[1] Includes roasted concentrates.
[2] Excludes imports for conversion and reexport as follows: 1946, 276,465 pounds; 1947–50, none.
[3] 10 pounds.
[4] At mines and at plants making molybdenum products.

DOMESTIC PRODUCTION

The year 1950 was marked by expansion of production to the limit of existing facilities and by construction and development programs designed further to expand production rates. Production of molybdenum concentrates totaled 28,480,000 pounds (contained molybdenum) in 1950, an increase of 26 percent over 1949. The chief mineral of molybdenum is molybdenite (MoS_2), which comprised virtually the entire output in 1950; powellite [$Ca(Mo,W)O_4$] contributed a relatively small quantity. Wulfenite ($PbMoO_4$), once mined from several deposits in southwestern United States, has not been produced since 1944.

Molybdenum was produced in six States in 1950; Utah led, followed in order by Colorado, New Mexico, Arizona, Nevada, and California. Output of concentrates at mines operated solely or almost solely for molybdenum was 12,082,000 pounds in 1950, an increase of 10 percent from 1949, whereas byproduct concentrates from copper and tungsten operations totaled 16,398,000 pounds, an increase of 42 percent. Byproduct molybdenum represented 58 percent of the total concentrates produced in 1950 compared with 51 percent in 1949.

Shipments of molybdenum concentrates were 44,544,000 pounds (contained molybdenum) in 1950, an increase of 91 percent over 1949. Shipments in 1950 comprised 39,158,000 pounds to domestic consumers and 5,386,000 pounds for export.

A historical review of the molybdenum industry in the United States and a table showing its spectacular growth were presented in the Molybdenum chapter of Minerals Yearkbook 1948 (pp. 816–819).

TABLE 2.—Molybdenum in ore and concentrates produced and shipped from mines in the United States, 1941–50

Year	Production (thousands of pounds)	Shipped from mines		Year	Production (thousands of pounds)	Shipped from mines	
		Weight (thousands of pounds)[1]	Value (thousands of dollars)[2]			Weight (thousands of pounds)[1]	Value (thousands of dollars)[2]
1941	40,363	38,377	25,996	1946	18,218	16,787	11,529
1942	56,942	66,437	47,275	1947	27,047	22,190	15,178
1943	61,667	53,955	38,500	1948	26,706	29,669	20,418
1944	38,679	39,423	27,999	1949	22,530	23,280	19,332
1945	30,802	33,683	23,976	1950	28,480	44,544	37,729

[1] Figures for 1941–44 represent shipments from mines, plus concentrates converted to oxide by producer at Miami, Ariz.; those for 1945–50 represent shipments to domestic and foreign customers, plus concentrates converted to oxide at Miami, Ariz., and Langeloth, Pa.
[2] Largely estimated by Bureau of Mines.

Arizona.—The Miami Copper Co. has been a regular producer of molybdenum concentrates since 1938. Molybdenite concentrates are recovered as a byproduct of its copper operations at Miami, Ariz., where they are converted to molybdic oxide. Output in 1950 was 25 percent greater than in 1949. Arizona remained in fourth place as a producer of molybdenum in 1950.

California.—California dropped from fifth to sixth place as a producer of molybdenum in 1950. The only producer in California was the United States Vanadium Corp. at Bishop, where the mineral is recovered as a byproduct of tungsten production. Recovery of molybdenum was 26 percent less than in 1949. Molybdenum is present in the tungsten ore as molybdenite and powellite.

Colorado.—Colorado dropped from first to second place in 1950, but the output of molybdenum was 11 percent more than in 1949.

The Climax Molybdenum Co., operating the world-famous deposit at Climax, Colo., was the sole producer of molybdenum concentrates in 1950. Before 1948 the Climax deposit was exploited solely for molybdenum, but since that time tungsten and tin have been recovered as byproducts. Although the tungsten content of the ore is very low, the total byproduct-tungsten production was adequate to raise the Climax mine to fifth place as a tungsten producer.

During the first half of 1950 operations at Climax were curtailed because of the low demand for molybdenum products, but during the second half production was increased to the limit of mine and mill capacity. The main production is from underground workings, using a caving system of mining, but it is reported that in 1950 some ore was again obtained from the open-cut. A long tunnel has been driven to develop the ore body below the present operating level, but actual production will not be obtained from this portion of the mine until extensive development workings are completed. The expansion program at Climax also includes additional mill and camp facilities.

Nevada.—Since 1941 the Nevada Mines Division of the Kennecott Copper Corp. has been the only producer of molybdenite concentrates in Nevada. The concentrates are recovered as a byproduct of the McGill concentrator, where copper ores from the company Ruth and Copper Flat operations and from the Emma Nevada group of Consolidated Coppermines Corp. are milled. Output of concentrates was 176 percent more than in 1949.

New Mexico.—The Chino Mines Division of the Kennecott Copper Corp., Hurley, and the Molybdenum Corp. of America, Questa, continued to be the only producers of molybdenite in New Mexico in 1950. At Hurley, molybdenite has been recovered as a byproduct of copper operations since 1937. The copper ore mined in 1950 contained slightly less molybdenum than in 1949, and production of molybdenum declined 4 percent. The Questa mine, operated for molybdenum only, was opened in 1919 and since 1923 has been a regular producer. In 1950 a portion of the output was obtained from tailings produced in prior years, and the output of molybdenum declined 14 percent. The concentrates produced at Questa are shipped to the processing plant of the Molybdenum Corp. of America at Washington, Pa., where the company produces ferromolybdenum, calcium molybdate, molybdic oxide, and other molybdenum products.

Utah.—Utah was the largest molybdenum-producing State. The sole producer in Utah is the Utah Copper Division of the Kennecott Copper Corp., which since 1936 has been recovering molybdenite as a byproduct of copper at its Arthur and Magna concentrators. Output of molybdenite concentrates in Utah was 46 percent more than in 1949.

CONSUMPTION AND USES

Consumption (as measured by shipments to domestic consumers) of molybdenum products in the United States was 118 percent more in 1950 than in 1949. The largest single use for molybdenum is as an alloying element in the manufacture of steels, to which it is added as molybdic oxide, calcium molybdate, or ferromolybdenum. In general, when an entire open-hearth heat is to be alloyed to a degree not exceeding 0.8 percent molybdenum, the addition is in the form of molybdic oxide or calcium molybdate; ferromolybdenum is used when higher percentages of molybdenum are desired. Of the total molybdenum used in the United States, it is estimated that about 70 percent is in steels. Molybdenum is finding an expanding market in the high-temperature alloys developed for various components of gas turbines, as well as in jet aircraft engines and turbosuperchargers.

Much smaller quantities (about 20 percent of the total) of molybdenum, chiefly in the form of ferromolybdenum and molybdic oxide, are employed in gray iron and malleable castings. Molybdenum in various forms finds limited employment in the chemical, electrical, and ceramic industries, which comprise about 10 percent of the total. A relatively small quantity of concentrates (50,000 to 75,000 pounds of contained molybdenum annually) is used by a few steel companies as an addition to molten metal in the ladle to raise the sulfur content and improve machinability, in addition to gaining the benefit of the contained molybdenum.

Experiments regarding the use of molybdenum as a fertilizer are continuing, and favorable results are indicated.[1]

Interest in the possibility of using molybdenum metal in a temperature range above that filled by present-day high-temperature alloys has led to the development by Climax Molybdenum Co. of Michigan (a research subsidiary of Climax Molybdenum Co.) of a vacuum furnace capable of producing ingots 9 inches in diameter weighing up to 1,000 pounds.[2] The ability of molybdenum to plate itself on friction surfaces and withstand high temperatures and pressures has resulted in commercial development of a molybdenum lubricant for this purpose.[3]

TABLE 3.—Production and shipments of molybdenum products [1] in the United States, 1946–50, in pounds of contained molybdenum

Year	Production	Shipments		
		To domestic consumers	Exports [2]	Total
1946	15,039,100	16,501,700	442,400	16,944,100
1947	20,659,700	19,878,500	866,400	20,744,900
1948	24,445,300	23,808,900	1,215,800	25,024,700
1949	19,624,200	15,019,000	1,314,100	16,333,100
1950	25,347,800	32,735,700	1,955,100	34,690,800

[1] Comprises ferromolybdenum, molybdic oxide, and molybdenum salts and metal.
[2] Reported by producers to the Bureau of Mines.

STOCKS

The accompanying table shows industry stocks of molybdenum concentrates and products, 1946–50. Drastic reductions in the industry stocks of both types are noteworthy; this reduction was partly caused by the increase in demand for products containing molybdenum and partly by purchases by the Government.

[1] Science News Letter, vol. 57, No. 15, April 15, 1950, p. 236.
[2] Steel, vol. 126, No. 14, April 3, 1950, p. 64.
[3] Engineering and Mining Journal, vol. 151, No. 3, March 1950, p. 108.

TABLE 4.—Industry stocks of molybdenum concentrates and products, Dec. 31, 1946–50, in thousands of pounds of contained molybdenum

Year	Concentrates [1]	Products [2]		Total
		Producers	Consumers	
1946	19,275	8,211	2,582	30,068
1947	23,661	8,126	2,695	34,482
1948	21,206	7,547	(3)	[4] 28,753
1949	19,159	10,838	(3)	[4] 29,997
1950	4,090	1,495	(3)	[4] 5,585

[1] At mines and at plants making molybdenum products.
[2] Comprises ferromolybdenum, molybdic oxide, and molybdenum salts and metal.
[3] Figure not available.
[4] Excludes stocks of molybdenum products at consumers' plants.

PRICES

Effective December 1, 1950, the published price, f. o. b. mines, of molybdenite in concentrates containing 90 percent MoS_2 was increased to 60 cents a pound (equivalent to $1 a pound of molybdenum contained). The former price of 54 cents a pound of MoS_2 had been in effect since January 1949, and a price of 45 cents a pound of MoS_2 had been in effect from 1938 to 1949. Molybdenum concentrates are shipped, largely to processing plants, for conversion to molybdic oxide, ferromolybdenum, and calcium molybdate, all of which are used in manufacturing iron and steel. The prices of the principal molybdenum products are based on a pound of contained molybdenum, f. o. b. producer's plant. Effective December 1, 1950, the price of molybdic oxide was raised to $1.14, calcium molybdate to $1.15, and ferromolybdenum to $1.32; the former prices were $0.95, $0.95, and $1.10, respectively.

FOREIGN TRADE [4]

Imports of molybdenum ore and concentrates into the United States are normally small; 2,784 pounds (contained molybdenum) were received in 1950, all from Japan, compared with total imports of 48,148 pounds in 1949. Some molybdenum ore and concentrates are occasionally imported for conversion to molybdenum products for export; none has been so imported since 1946.

Exports of molybdenum concentrates (including roasted concentrates) were 6,234,521 pounds (contained molybdenum) in 1950 compared with 5,319,780 pounds in 1949. United Kingdom and Germany were the chief foreign markets in 1950, taking 61 and 18 percent, respectively.

Exports of ferromolybdenum were 1,178,604 pounds (gross weight) in 1950 compared with 955,103 pounds in 1949, and those of molybdenum metal and alloys were 146,075 pounds compared with 86,139 pounds (revised figure) in 1949.

Tariff.—The duty on molybdenum ore and concentrates was increased from 17½ cents to 35 cents a pound on the metallic molybde-

[4] Figures on imports and exports (unless otherwise indicated) compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

num contained effective after December 31, 1950, as a result of cancellation of the Reciprocal Trade Agreement with Mexico. The duty on ferromolybdenum, molybdenum metal and powder, calcium molybdate, and other compounds and alloys of molybdenum continued to be 50 cents a pound of molybdenum contained plus 15 percent ad valorem.

TABLE 5.—Molybdenum ore and concentrates (including roasted concentrates) exported from the United States, 1948–50, by countries of destination.

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Molybdenum content (pounds)	Value	Molybdenum content (pounds)	Value	Molybdenum content (pounds)	Value
Austria	10,000	$4,968	5,334	$7,952	20,918	$19,515
Canada-Newfoundland	159,230	104,336	62,289	50,332	226,297	194,187
Canal Zone					465	458
France	1,591,210	1,161,353	1,525,564	1,283,495	674,296	591,249
Germany	131,060	74,945	267,285	246,731	1,105,577	956,329
Italy	63,201	48,945	64,906	61,262	43,420	38,638
Japan					40,677	34,197
Mexico			5,370	3,250	345	247
Netherlands	13,384	10,567	14,700	13,680	61,200	65,000
Norway			60,000	56,419		
Sweden	262,570	195,721	545,761	459,279	274,406	211,195
United Kingdom	1,901,686	1,397,898	2,768,571	2,441,723	3,786,920	3,342,637
Total	4,132,341	2,998,733	5,319,780	4,624,123	6,234,521	5,453,652

WORLD REVIEW

United States production of molybdenum in 1950 was 90 percent of estimated world production. The balance of the reported output came from Chile, Norway, Canada, and Australia, although many other countries produce molybdenum in small quantities. Very little in the way of new developments abroad was reported, but some progress was made on existing projects.

Canada.—Production of molybdenum in Canada was resumed in 1950 after a complete cessation of activity in 1949; 28 metric tons were produced as compared with 509 tons in 1944, the peak war year.

Chile.—Based on estimated exports, production of molybdenum in Chile increased from 558 metric tons in 1949 to 800 tons in 1950.

Finland.—The Matasvaara molybdenum mine shut down in 1947, was dismantled and part of the equipment sold to Outokumpu Oy for the Aijala mine.[5]

Norway.—Production of molybdenum in Norway continued to decline in 1950, totaling 62 metric tons compared with 71 tons in 1949.

Yugoslavia.—Progress was reported at the new molybdenum mine near Mackatica in Serbia, which was expected to begin operations in 1951. A 3-mile tunnel was driven, which is connected to the mine face by a 1,300-foot shaft. It is reported that the shaft will be used to transport water to a hydroelectric plant to be built at the bottom of the shaft.[6]

[5] Mineral Trade Notes, vol. 31, No. 2, August 1950, p. 27.
[6] Mineral Trade Notes, vol. 30, No. 2, February 1950, p. 24.

TABLE 6.—World production of molybdenum in ores and concentrates, by countries, 1942–50, in metric tons [1]

[Compiled by Berenice B. Mitchell]

Country [1]	1942	1943	1944	1945	1946	1947	1948	1949	1950
Australia	7	15	9	(2)	4	2	2	4	3
Austria	4	5	7	(2)	20	1	(3)	9	(3)
Canada	43	178	509	228	184	207	83	--------	28
Chile	580	680	1, 051	841	560	402	532	558	[4] 800
China:									
Manchuria	[5] 384	[5] 516	[5] 516	[5] 30	(3)	(3)	(3)	(3)	(3)
Other Provinces	[6] 3	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Finland	126	108	110	92	99	70	--------	--------	--------
France	2	11	7	--------	--------	--------	--------	(3)	(3)
Indochina	2	2	(2)	--------	--------	--------	--------	--------	(3)
Italy	18	16	(2)	--------	--------	--------	--------	--------	(3)
Japan	[7] 56	[7] 87	[7] 189	[7] 108	52	18	1	--------	(3)
Korea, South	217	291	394	54	--------	5	2	11	(3)
Mexico	855	1, 138	717	468	818	136	--------	--------	--------
Morocco, French	6	7	--------	--------	39	32	--------	--------	--------
Norway	368	227	248	76	10	98	79	71	62
Peru	154	85	62	29	4	3	2	2	(3)
Sweden	--------	12	20	3	--------	--------	2	9	(3)
United States	25, 829	27, 972	17, 545	13, 972	8, 264	12, 268	12, 114	10, 219	12, 918
Total (estimate)	29, 000	31, 400	21, 400	15, 900	10, 800	14, 000	13, 600	11, 500	14, 400

[1] Molybdenum is also produced in Greece, Rumania, Spain, Turkey, U. S. S. R., and Yugoslavia, but production data are not available. Estimates by author of chapter are included in total.
[2] Less than 1 ton.
[3] Data not yet available; estimate by author of chapter included in total.
[4] Estimated exports.
[5] Exports to Japan proper.
[6] Data represent areas designated as Free China during the period of Japanese occupation.
[7] Preliminary data for fiscal year ended Mar. 31 of year following that stated.

Natural Gas

By D. S. Colby, H. J. Barton and B. E. Oppegard

GENERAL SUMMARY

MARKETED production of natural gas is estimated to have increased 16 percent to 6,281 billion cubic feet in 1950, the largest annual increase, both in quantity and percentage, of the past decade. The average annual increase of marketed production from 1940 to 1950 was 8 percent.

Consumption of natural gas advanced 21, 12, and 15 percent for domestic, commercial, and industrial customers respectively. This compares with gains in 1949 of 11, 8, and 3 percent. Industrial uses (other than carbon black, petroleum refineries, etc.) grew most rapidly in 1950, rising 23 percent above 1949.

The average value of natural gas at the well increased 0.3 cent to 6.6 cents per thousand cubic feet in 1950. The total value at the wellhead of marketed production on this basis would be 416 million dollars, 72 million dollars more than in 1949.

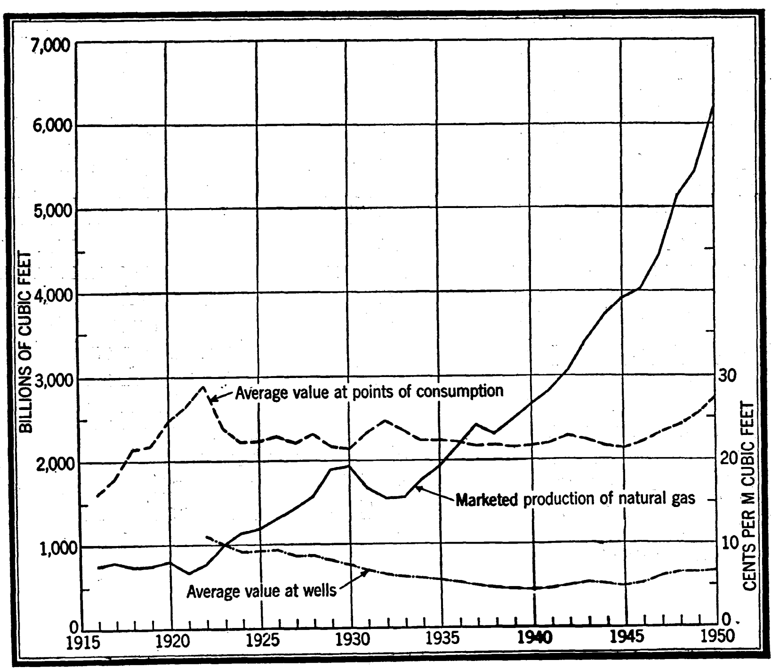

FIGURE 1.—Production and value of natural gas in the United States, 1916–50.

The average value at point of consumption of natural gas in 1950, according to preliminary data, was 71.3 cents per thousand cubic feet for residential consumers, 48.3 cents for commercial, 13.7 cents for industrial, and 27.4 cents for all types. The corresponding prices in 1949 were 67.1, 45.5, 12.9, and 25.4 cents per thousand cubic feet.

TABLE 1.—Salient statistics of natural gas in the United States, 1946–50

	1946	1947	1948	1949	1950 [1]
MILLION CUBIC FEET					
Supply:					
Marketed production [2]	4,030,605	4,582,173	5,148,020	5,419,736	6,281,048
Withdrawn from storage	56,138	86,643	79,035	106,368	175,260
Total supply	4,086,743	4,668,816	5,227,055	5,526,104	6,456,308
Disposition:					
Consumption	4,012,930	4,426,544	4,945,149	5,195,484	6,026,410
Exports	17,675	18,149	18,704	20,054	26,191
Stored	75,458	96,316	136,406	172,051	228,270
Lost in transmission, etc	(3)	127,807	126,796	138,515	175,437
Total disposition	4,106,063	4,668,816	5,227,055	5,526,104	6,456,308
VALUE					
Production (at wells)...thousand dollars	212,251	274,709	333,173	344,034	416,224
Average per M cubic feet...cents	5.3	6.0	6.5	6.3	6.6

[1] Preliminary figures.
[2] For 1946, equivalent to consumption plus exports. For subsequent years, comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.
[3] Figure not available.

SPECIAL PROBLEMS

Further growth of the natural-gas industry, at the end of 1950, appeared to be limited not by any lack of demand but by the quantity of well casing and line pipe it was able to acquire. With few exceptions, growth was taking place by expansion of deliveries to localities already being served by natural gas. It seemed certain that New England, one of the few remaining areas not already being served with natural gas, would become a consumer by 1952. A proposal to supply natural gas to the Pacific Northwest from Canada was delayed because proved reserves in Alberta Province were not considered adequate to satisfy both export and local requirements.

The decision of the United States Supreme Court on December 11, 1950,[1] which upheld the right of a State regulatory agency to set a minimum wellhead price for natural gas, raised the possibility of diminished Federal Power Commission control over the field price of gas and subsequent increases in the field price of gas. Gas, however, remained one of the country's primary sources of cheap power. Several of the new aluminum-reduction plants necessitated by the national defense program and requiring large quantities of low-cost electricity were among the prospective new large-scale users.

[1] *See* Government Regulation.

The expansion of residential loads in cities far removed from the source of gas made some method of storage near the point of consumption very desirable. To facilitate acquisition of underground storage reservoirs by natural-gas companies, Senator Douglas of Illinois introduced a bill in the United States Senate providing for utility and pipeline companies to exercise eminent domain to obtain natural-gas storage fields.[2]

GOVERNMENT REGULATION

On January 9, 1950, the United States Supreme Court upheld the Federal Power Commission claim to authority over the East Ohio Gas Co., a company operating wholly within the State of Ohio,[3] and thereby confirmed that the Commission's authority was not restricted to companies operating in more than one State.

On April 16, 1950, President Truman vetoed the Kerr bill, which sought to exclude from Federal Power Commission jurisdiction natural-gas exploration, drilling, production, or gathering, sale "at arm's length," sale "before arm's length," sale to interstate facilities, local distribution, and local distribution facilities.

In conformity with this veto, the Federal Power Commission rescinded its Order 139, which stated that the Commission would not assert jurisdiction over independent producers and gatherers of natural gas who might be subject to jurisdiction solely because of "arm's length" sales of natural gas.

On December 11, 1950, the United States Supreme Court upheld the Oklahoma Supreme Court decision that a State, to prevent physical and economic waste, has the right to set a minimum wellhead price on natural gas and also has the power to require a gatherer to take gas ratably from various producers in the reservoir.[4] Under authority of this decision, the wellhead price of gas in the Guyman Hugoton field was set at 7 cents per thousand cubic feet.

The Petroleum Administration for Defense was established in 1950 under the United States Department of the Interior to carry out various functions under the Defense Production Act with regard to the oil and gas industry. This agency has authority over natural- and manufactured-gas production, transmission, and distribution.

RESERVES

The committee on natural-gas reserves of the American Gas Association reported estimated proved recoverable reserves of natural gas in the United States to be 185,592,699 million cubic feet on December 31, 1950, an increase of 3 percent over 1949. New discoveries in 1950 made a gross addition to proved reserves of 2.9 trillion cubic feet, and extensions of old fields added 9.2 trillion.

[2] S.1000, 82d Congress, 1st sess.
[3] *Federal Power Commission* v. *East Ohio Gas Co. et al.*, 338 U. S. 464.
[4] *Phillips Petroleum Co.* v. *Oklahoma et al.*, 340 U. S. 190.

TABLE 2.—Estimated proved recoverable reserves of natural gas in the United States, 1949–50, in million cubic feet [1]

[Committee on natural-gas reserves, American Gas Association]

State	Reserves [2] as of Dec. 31, 1949	Changes in reserves during 1950			
		Extensions and revisions [2]	Discoveries of new fields and new pools in old fields [2]	Net change in underground storage [3]	Net production [4]
Arkansas	874,190	65,072	23,129	540	55,338
California [5]	9,991,635	225,279	71,840	4,028	532,396
Colorado	1,227,095	−134,453	41,426	----------	18,595
Illinois	233,192	26,774	5,700	----------	35,773
Indiana	25,200	6,720	4,920	750	6,400
Kansas	14,089,560	64,729	30,360	153	393,968
Kentucky	1,349,397	49,294	8,200	−908	75,400
Louisiana [5]	26,687,811	2,010,120	751,133	----------	915,798
Michigan	214,911	−14,820	2,741	10,528	18,286
Mississippi	2,528,969	130,470	5,030	----------	145,263
Montana	803,471	34,951	----------	2,402	43,463
Nebraska	8,063	9,028	28,073	----------	1,058
New Mexico	6,241,003	866,625	124,404	6,883	248,245
New York	66,685	200	----------	1,094	3,200
Ohio	652,571	38,751	7,900	6,840	47,200
Oklahoma	11,625,979	486,813	121,163	8,250	607,918
Pennsylvania	621,680	31,000	50,000	−509	75,000
Texas [5]	99,170,403	5,055,893	1,557,691	490	3,380,400
Utah	65,577	8,196	15,112	----------	4,133
West Virginia	1,715,233	105,152	21,750	13,540	205,000
Wyoming	2,173,677	96,631	2,749	220	78,288
Other States [6]	15,042	9,956	4,030	----------	1,556
Total	180,381,344	9,172,381	2,877,351	54,301	6,892,678

State	Reserves as of Dec. 31, 1950 [2]				
	Nonassociated [7]	Associated [8]	Dissolved [9]	Underground storage [10]	Total
Arkansas	450,935	157,869	296,789	2,000	907,593
California [5]	2,702,746	2,286,788	4,751,693	19,159	9,760,386
Colorado	474,704	33,528	607,241	----------	1,115,473
Illinois	5,643	15,000	209,250	----------	229,893
Indiana	4,000	5,000	21,440	750	31,190
Kansas	13,381,105	152,189	228,239	29,301	13,790,834
Kentucky	1,254,997	----------	64,000	11,586	1,330,583
Louisiana [5]	22,477,745	4,162,574	1,892,947	----------	28,533,266
Michigan	121,867	----------	40,906	32,301	195,074
Mississippi	1,772,969	410,436	335,801	----------	2,519,206
Montana	722,647	44,799	25,421	4,494	797,361
Nebraska	14,886	21,213	8,007	----------	44,106
New Mexico	3,978,271	2,098,103	896,210	18,086	6,990,670
New York	53,375	----------	595	10,809	64,779
Ohio	550,548	----------	34,500	73,814	658,862
Oklahoma	7,509,209	1,011,782	3,088,927	24,369	11,634,287
Pennsylvania	528,569	----------	40,750	57,852	627,171
Texas [5]	71,529,387	17,646,015	13,228,185	490	102,404,077
Utah	76,331	----------	8,421	----------	84,752
West Virginia	1,513,009	----------	81,500	56,166	1,650,675
Wyoming	1,481,156	128,456	584,864	513	2,194,989
Other States [6]	24,356	----------	3,116	----------	27,472
Total	130,628,455	28,173,752	26,448,802	341,690	185,592,699

[1] Volumes are reported at a pressure base of 14.65 pounds per square inch absolute and at a standard temperature of 60° F.
[2] Excludes gas loss due to natural-gas liquids recovery.
[3] The net difference between gas stored in and gas withdrawn from underground storage reservoirs.
[4] Net production equals gross withdrawals less gas injected into underground reservoirs; changes in underground storage are excluded. December production partly estimated.
[5] Includes off-shore reserves.
[6] Includes Alabama, Florida, Maryland, Missouri, Nebraska, and Virginia.
[7] Nonassociated gas is free gas not in contact with crude oil in the reservoir.
[8] Associated gas is free gas in contact with crude oil in the reservoir.
[9] Dissolved gas is gas in solution with crude oil in the reservoir.
[10] Gas held in underground reservoirs for storage purposes only.

PRODUCTION

GROSS PRODUCTION

Estimated gross production of natural gas in the United States in 1949 was 7,546,825 million cubic feet, 5 percent over 1948 production. In general the increases occurred in the prolific producing States of the Southwest (Oklahoma excepted) and in the newer production of the Rocky Mountain States. Gross production declined in all Appalachian producing States and in Illinois and Michigan.

TABLE 3.—Gross withdrawals and disposition of natural gas in the United States, 1948–49, by States, in million cubic feet

State	Gross withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and wasted [3]
1948						
Arkansas	40,300	33,410	73,710	53,946	11,000	8,764
California	235,000	513,700	748,700	570,954	167,560	10,186
Colorado	6,500	5,000	11,500	8,967	371	2,162
Illinois	200	39,800	40,000	14,062	4,380	21,558
Indiana	400	1,300	1,700	553	1,135	12
Kansas	177,360	100,640	278,000	245,189	2,913	29,898
Kentucky	64,830	9,500	74,330	70,095	1,233	3,002
Louisiana	554,610	418,390	973,000	686,061	201,707	85,232
Michigan	17,290	6,760	24,050	14,981	2,886	6,183
Mississippi	55,000	41,000	96,000	59,899	30,610	5,491
Missouri	27	----------	27	27	----------	----------
Montana	34,710	4,000	38,710	36,551	412	1,747
New Mexico	45,310	193,420	238,730	194,749	2,146	41,835
New York	4,600	200	4,800	4,705	93	2
Ohio	66,650	2,000	68,650	65,619	3,023	8
Oklahoma	411,340	262,980	674,320	480,573	20,784	172,963
Pennsylvania	83,670	4,000	87,670	87,578	87	5
Texas	2,530,000	920,000	3,450,000	2,289,923	757,146	402,931
Utah	6,640	10	6,650	6,610	----------	40
West Virginia	200,500	7,500	208,000	203,681	2,084	2,235
Wyoming	52,850	26,430	79,280	52,424	11,009	15,847
Other States [4]	760	190	950	873	----------	77
Total	4,588,547	2,590,230	7,178,777	5,148,020	1,220,579	810,178
1949						
Arkansas	37,500	30,870	68,370	47,788	15,431	5,151
California	217,000	518,800	735,800	550,903	173,954	10,943
Colorado	6,500	7,750	14,250	8,490	370	5,390
Illinois	350	37,500	37,850	12,391	3,566	21,893
Indiana	250	1,900	2,150	334	927	889
Kansas	237,800	86,600	324,400	294,078	3,339	26,983
Kentucky	46,700	9,350	56,050	51,851	1,286	2,913
Louisiana	785,250	240,250	1,025,500	732,845	185,533	107,122
Michigan	14,350	6,600	20,950	14,753	413	5,784
Mississippi	74,100	38,000	112,100	68,062	38,603	5,435
Montana	33,100	3,750	36,850	35,291	183	1,376
New Mexico	49,920	191,700	241,620	204,961	7,109	29,550
New York	3,600	170	3,770	3,693	72	5
Ohio	47,400	1,700	49,100	46,512	2,087	501
Oklahoma	373,200	258,000	631,200	435,262	26,920	169,018
Pennsylvania	81,500	3,500	85,000	84,739	170	91
Texas	2,740,000	1,082,000	3,822,000	2,588,921	798,211	434,868
Utah	6,150	210	6,360	6,126	----------	234
West Virginia	178,300	7,000	185,300	181,176	1,633	2,491
Wyoming	52,450	35,000	87,450	50,815	13,398	23,237
Other States [4]	706	49	755	745	----------	10
Total	4,986,126	2,560,699	7,546,825	5,419,736	1,273,205	853,884

[1] Marketed production plus quantities used in repressuring, vented and wasted.
[2] Gas sold or consumed by producers (*see* table 1).
[3] Includes gas (mostly-residue) blown to the air, but does not include direct waste on producing properties, except where data are available.
[4] Florida, Missouri (1949 only), North Dakota, South Dakota, Tennessee, and Virginia.

Repressuring continued its steady growth, increasing in all major producing States except Louisiana and West Virginia. The quantity of gas used in repressuring or recycling in 1949 totaled 1,273,205 million cubic feet, 52,626 million more than in 1948.

The use of underground reservoirs for storing natural gas is becoming progressively more important, as markets at great distances from the source of production expand. Net gas placed in underground storage increased from 57,371 million cubic feet in 1948 to 65,683 million in 1949. A better indicator of the use being made of this type of storage is the gross amount stored, which rose from 136,406 million cubic feet in 1948 to 172,051 million in 1949. The States showing the largest advances in total gas stored were, in descending order, Michigan, West Virginia, Ohio, California, Pennsylvania, Oklahoma, and Kansas.

TABLE 4.—Natural gas stored underground in and withdrawn from storage fields, by States of location, 1948–49, in million cubic feet

State	1948			1949		
	Total stored	Total withdrawn	Net stored	Total stored	Total withdrawn	Net stored
Arkansas		10	−10	495		495
California	9,767	12,197	−2,430	14,573	11,699	2,874
Illinois	171	57	114	12	93	−81
Indiana	533	357	176	343	476	−133
Kansas	10,494	9,738	756	12,712	11,104	1,608
Kentucky	9,387	2,029	7,358	6,781	4,446	2,335
Michigan	10,479	4,047	6,432	26,379	16,536	9,843
Montana	2,638	714	1,924	2,241	1,825	416
New Mexico	253	91	162	1,108	526	582
New York	5,174	2,030	3,144	4,865	2,194	2,671
Ohio	27,549	13,352	14,197	34,325	15,935	18,390
Oklahoma	4,555	4,701	−146	8,150	3,370	4,780
Pennsylvania	28,835	14,586	14,249	32,879	16,608	16,271
Texas	6,839	12	6,827	1,970	1,469	501
West Virginia	17,156	15,045	2,111	24,442	19,686	4,756
Wyoming	2,576	69	2,507	776	401	375
Total	136,406	79,035	57,371	172,051	106,368	65,683

MARKETED PRODUCTION

Marketed production of natural gas in 1949 rose 5 percent to 5,419,736 million cubic feet. Of the four largest producing States, marketed production increased in Texas and Louisiana but decreased in California and Oklahoma. The only other States showing an advance in marketed production were Kansas, Mississippi, and New Mexico. The marketed production of Texas continued to grow as a percentage of the total marketed production, reaching 48 percent in 1949, but this was still less than its proportion of proved reserves.

TABLE 5.—Marketed production of natural gas in the United States, by States, 1945–49

State	Quantity: Million cubic feet 1945	1946	1947[1]	1948[1]	1949[1]	Percent of total 1949	Estimated value at wells (thousand dollars) 1949
Arkansas	46,600	45,177	50,630	53,946	47,788	0.9	1,912
California	502,442	487,904	560,510	570,954	550,903	10.2	64,731
Colorado	4,914	6,728	8,392	8,967	8,490	.2	443
Florida	6	6	8	27	39	(2)	2
Illinois	16,663	17,166	17,023	14,062	12,391	.2	1,398
Indiana	1,543	1,094	877	553	334	(2)	25
Kansas	145,959	165,725	209,321	245,189	294,078	5.4	15,910
Kentucky	81,714	70,396	96,459	70,095	51,851	1.0	9,888
Louisiana	542,789	525,178	581,398	686,061	732,845	13.5	32,025
Michigan	21,874	20,879	18,812	14,981	14,753	.3	2,242
Mississippi	4,587	7,225	40,037	59,899	68,062	1.2	4,199
Missouri	90	40	38	27	24	(2)	4
Montana	31,829	30,713	34,282	36,551	35,291	.6	1,962
New Mexico	105,023	119,262	142,740	194,749	204,961	3.8	5,985
New York	9,210	5,084	4,600	4,705	3,693	.1	907
North Dakota	217	344	442	643	533	(2)	27
Ohio	49,967	61,570	68,946	65,619	46,512	.9	8,991
Oklahoma	357,530	380,938	419,010	480,573	435,262	8.0	20,327
Pennsylvania	82,188	92,443	91,971	87,578	84,739	1.6	21,727
South Dakota	5	5	6	2	1	(2)	(3)
Tennessee	10	47	80	127	83	(2)	8
Texas	1,711,401	1,776,148	1,992,704	2,289,923	2,588,921	47.8	118,832
Utah	6,562	4,252	6,040	6,610	6,126	.1	368
Virginia	56	57	64	74	65	(2)	5
West Virginia	160,225	178,958	192,233	203,681	181,176	3.3	29,296
Wyoming	35,282	33,266	45,550	52,424	50,815	.9	2,820
Total	3,918,686	4,030,605	4,582,173	5,148,020	5,419,736	100.0	344,034

[1] Includes gas stored and lost in transmission.
[2] Less than 0.5 percent.
[3] Less than $500.

NUMBER OF WELLS

In 1950, 2,844 new gas wells were drilled in the United States compared with 2,887 in 1949. The number completed in Texas declined by 99; the number completed in West Virginia increased by 40. This reverses the record for the last several years, when completions were increasing in Texas and decreasing in West Virginia. The number of gas wells completed in New Mexico rose sharply to 90 in 1950 from 53 in 1949. Ten wells were reported completed in Nebraska, considerable activity for this State.

The total number of producing wells at the end of 1949 was 64,146, slightly lower than the previous year. The indicated number of wells abandoned, shut in, or reclassified during 1949 is 2,953.

TABLE 6.—Gas wells in the United States, 1948–50, by States

State	Producing Dec. 31, 1948	Drilled during 1949 [1]	Producing Dec. 31, 1949	Drilled during 1950 [1]
Arkansas	165	3	168	2
California	365	40	395	51
Colorado	30	4	30	12
Illinois	100	6	100	17
Indiana	800	30	750	51
Kansas	3,000	419	3,300	400
Kentucky	3,480	193	3,610	157
Louisiana	2,210	211	2,400	196
Michigan	700	23	650	30
Mississippi	75	5	75	9
Missouri	100	[2] 6 (Missouri and Nebraska)	[2] 90 (Missouri and Nebraska)	10
Nebraska	------			10
Montana	760	54	800	20
New Mexico	230	53	270	90
New York	1,600	------	1,400	------
Ohio	7,000	308	6,700	278
Oklahoma	3,400	213	3,500	249
Pennsylvania	18,800	215	18,400	210
Tennessee	18	------	18	------
Texas	5,100	746	5,800	647
West Virginia	16,100	344	15,500	384
Wyoming	145	8	150	18
Alabama, North Dakota, South Dakota, Utah, and Virginia	34	6	40	3
Total	64,212	2,887	64,146	2,844

[1] From Oil and Gas Journal.
[2] Combined to avoid disclosure of individual company operations.

DEVELOPMENT AND PRODUCTION BY STATES [5]

Arkansas.—J. W. Sanders, chief engineer, Arkansas Oil and Gas Commission, reports that gas production from oil and condensate wells in south Arkansas rose in 1950 to 64,791 million cubic feet from 58,880 million in 1949. This increase was partly due to rescinding a cut in "allowables" placed on the controlled fields in 1949.

Production of dry gas from wells in northwest Arkansas increased from 6,901 million cubic feet in 1949 to 8,017 million in 1950. Of seven wildcat wells drilled in northwest Arkansas in 1950, one, the Arkansas Western No. 1, Franklin County, discovered a new reservoir.

California.—R. M. Bauer, Southern California Gas Co., reports that net dry-gas withdrawals from formation in 1950 totaled 533,809 million cubic feet compared with 546,026 million in 1949. In addition, 36,052 million cubic feet of gas were recovered as liquids in 1950 compared with 35,118 million in 1949. Receipts of natural gas in California via interstate pipeline increased from 94,099 million cubic feet in 1949 to 148,039 million in 1950.

Additions to reserves in 1950 again did not equal production, and proved reserves were estimated to have declined 231,249 million cubic feet to 9,760,386 million cubic feet.

Colorado.—J. R. Schwabrow, U. S. Geological Survey, reports that 12 gas wells were completed in 1950 with a total open flow of 72 million cubic feet, the greatest number of gas wells completed in Colorado in any year to date. New discoveries were made at Armstrong, Lee, and Loveland in the Julesburg Basin and at Ignacio in the San Juan Basin. Development wells were drilled at Barker Creek, Lee, Loveland, Powder Wash, and Piceance Creek. The pro-

[5] Based on latest available trade publications and reports from Federal and State agencies.

ductive area and proved reserves of this last-named field were increased considerably by these successful outpost wells. Three other wells here were dry holes.

Gas was marketed from Berthoyd, Craig, East Hiawatha, West Hiawatha, Powder Wash, and Thornburg fields. Marketing prospects were being investigated for Barker Creek, Douglas Creek, Piceance Creek, and the newly discovered fields. The casinghead gas from the Rangely field is employed only for recovery of liquids and lease use.

Net production increased from 13,529 million cubic feet in 1949 to 15,258 million in 1950. The advance was accounted for mainly by augmented field use at Rangely and larger sales from gas fields.

Illinois.—A. H. Bell and D. H. Swann, Illinois State Geological Survey, reported that 19 wells were completed as gas wells in 1950. Only three of these wells are being utilized, two in the Cottonwood pool and one in the Herald pool. The others have been shut in for lack of market or abandoned.

The two gas fields that have produced most of the Illinois natural gas marketed during the past decade—Ayers and Russellville—were both abandoned during 1950. About 60 billion cubic feet of solution gas were produced from oil wells and about one-half billion cubic feet from gas wells in oil fields during the year. Most of the 373 million cubic feet of Illinois gas marketed away from the field came from dry-gas wells within oil fields. About 13.7 billion cubic feet of solution gas from oil wells (a small amount of which originated in Indiana) was treated at Illinois natural-gasoline plants during 1950. Two and one-half billion cubic feet of the residue gas from these plants was used for repressuring, the rest being consumed as plant or lease fuel.

Indiana.—Six wildcat wells and 45 development gas wells were completed in Indiana in 1950. Twenty-two of these were in the Trenton field. The American Gas Association committee on natural-gas reserves reports a net production of 6,400 million cubic feet of natural gas in 1950 compared with 6,250 million in 1949.

Kansas.—Earl K. Nixon, Kansas State Geological Survey, reports that four new gas pools and two revivals—one each in Butler, Ford, Harper, Meade, Pawnee, and Rice Counties—were discovered in Kansas during 1950.

Three developments high lighted natural-gas operations in the State during the year: Addition in Seward County of about 200 square miles of gas-producing area as a southeast extension of the Hugoton field; opening of a new pool with strong production from the Mississippian in Meade County; and revival of the Pleasant Valley pool in eastern Ford County with large gas production, also from the Mississippian.

Roughly 220,000 acres were added to the Hugoton field, making the total producing area approximately 2.225,000 acres.

Of the 389 Kansas gas-well completions in 1950, 366 were in the Hugoton field, which had 2,216 producers at year end. Production from the Kansas part of the Hugoton gas field in 1950 was about 320 billion cubic feet, an increase of 29 percent over 1949. Roughly 85 percent of Kansas gas production during the year came from the Hugoton field.

Kentucky.—C. D. Hunter, chief geologist, Kentucky West Virginia Gas Co., reports that 193 producing gas wells, with an initial daily open flow capacity of 141 million cubic feet, were completed in Kentucky in 1950. Of these wells, 144 were in the Big Sandy gas field.

A new gas field was discovered in northern Scott County. Five wells starting in upper Ordovician encountered gas at depths of 320 to 375 feet in the Trenton limestone and developed a total daily open flow of 1.6 million cubic feet.

A careful check of gas production was made in 1950 by Hunter and other Kentucky geologists. Production was found to be 70 billion cubic feet in 1950, of which 95 percent came from the Big Sandy gas field.

Louisiana.—The Louisiana Department of Conservation Petroleum Activity Report for 1950 states that the production of natural gas was 1,496,817 million cubic feet, 47 percent above 1949. In all, 394 gas wells and condensate wells were completed, including 8 wildcat wells. The fields thus discovered and their location by parishes, were: Esterwood and Maxie in Acadia; Eugene Island Block 58 and Kent Bayou in Terrebonne; Opelousas in St. Mary; Sherburne in Pointe Coupee; Stonewall in DeSoto; and Unionville in Lincoln.

Michigan.—G. E. Eddy and W. L. Daoust of the Michigan Department of Conservation report that the most impressive dry natural-gas development of 1950 was the discovery and development of the Cannon Creek field in Tps. 24 and 25 N. and RS. 5 and 6 W., Missaukee and Kalkaska Counties. This was the first instance of discovery of gas in important quantities in the Traverse formation. Seventeen producing wells were completed with a combined daily open flow of more than 150 million cubic feet. In addition to the Cannon Creek discovery there were 6 other gas discoveries, but only 14 producing wells were drilled in these fields at the end of the year.

Seventy-five gas wells were drilled, of which 44 were facility wells drilled in gas-storage fields. Dry-gas production for the year totaled 12.5 billion cubic feet compared with 14.5 billion for the preceding year. Gas consumption, however, increased 15 billion cubic feet over 1949.

Mississippi.—In 1950 nine gas wells were completed in Mississippi, none of them wildcat wells. These completions included two in the Baxterville field, two in the Gwinville field, and four in the Sharon field.

According to the Monthly Petroleum Activity Report of the Mississippi State Oil and Gas Board, gross production of natural gas increased to 161,086 million cubic feet in 1950 compared with 108,978 million in 1949. Most of the increase came from the Baxterville and Gwinville fields. Sharon field, which had been shut in in 1949, was connected and started producing in July.

Missouri.—Frank C. Greene, district geologist, Missouri Division of Geological Survey and Water Resources, reports that 13 gas wells were completed in Missouri in 1950. Three wells were drilled in a new area south of Linkville, Platte County. In Cass County three wells were completed near Lisle and three near Harrisonville. Redrilling the old Smithville pool in Clay County yielded four producers. Total gas production in 1950 was reported as 81.6 million cubic feet from 14 wells.

Montana.—J. R. Schwabrow, U. S. Geological Survey, reports that 39 gas wells were completed with a total daily open flow of 118 million cubic feet. This is a smaller number of completions than during any year since 1939. Small exploratory wells at Bannatyne and Dunkirk were turned over to landowners for local use. The balance were field wells, Cub Bank having 13, Kevin-Sunburst 8, and the 101 Ranch-Plevna area 12. Only two wells were completed at Bowdoin and none at Cedar Creek, which accounts for the decline. The 101 Ranch-Plevna area is apparently a separate pool west of the southern part of the Cedar Creek anticline.

The small commercial production of the Havre field was suspended in June, and the Kicking Horse field ceased production in August owing to low well pressure.

On October 1 the Montana-Dakota Utilities Co. began transporting desulfurized Embar gas and sweet Frontier gas from the Worland field, Wyoming, through a new 340-mile line to Cabin Creek on the Bowdoin–Cedar Creek system. This gas will augment the supply from these two old fields, and some of it will be stored at Cedar Creek.

Net production of natural gas increased from 41,245 million cubic feet in 1949 to 42,745 million in 1950. Losses were cut to one-third of the 1949 volume.

Nebraska.—J. R. Schwabrow, U. S. Geological Survey, reports that in Nebraska during 1950, 11 gas wells were completed with a total initial production of 88 million cubic feet per day and located as follows: 7 with 69 million cubic feet per day in Huntsman field, 2 with 13 million in Southwest Sidney field, 1 with 5 million in Sunol field, all Cheyenne County, and 1 with 5 million in Big Springs field, Deuel County. At the end of the year only 1 of these 11 wells had been connected to a pipeline and put on production—the Ohio Oil Co. No. 1 Ruehman, Huntsman field. This well was supplying gas for the nearby town of Sidney. The Ohio Oil Co. also completed a gasoline plant in the Huntsman field to process all free and associated gas produced in the field and to supply dry gas to the North Central Gas Co. trunk line along the North Platte River.

New Mexico.—Foster Morrell, U. S. Geological Survey, reports that gas-development operations were accelerated in the San Juan Basin by the approval of the Federal Power Commission on July 14, 1950, of the El Paso Natural Gas Co. application to construct a pipeline from the San Juan Basin to Toprock, Ariz. During 1950, 5 new gas pools were discovered, and 88 gas wells were completed in the New Mexico portion of the San Juan Basin. Of these 33 were in the Fulcher Basin-Kutz Canyon pool and 31 in the Blanco and La Plata pools. No major gas fields were discovered in central or southeastern New Mexico in 1950; 32 gas wells were completed in Lea County.

The estimated production of gas in southeast New Mexico rose from 202,687 million cubic feet in 1949 to 207,787 million in 1950. Natural-gas deliveries in northwest New Mexico increased from 11,544 million cubic feet in 1949 to 14,410 million in 1950.

New York.—W. L. Kreidler, senior geologist, New York Geological Survey, reported natural-gas production in 1950 to have been 4,050 million cubic feet—2,800 million from the Medina horizon and 1,250 million from the Oriskany horizon. Forty wells were drilled into the Medina, of which 22 were facility wells in gas-storage fields. Four wells were completed into the Oriskany, but none resulted in commercial production.

North Dakota.—Wilson M. Laird, State geologist of the North Dakota Geological Survey, reported that 28 wells were producing gas in the State in 1950 and that no permits had been issued for gas-well drilling during the year. Production for 1950 was 608 million cubic feet. Some gas has been encountered in deep tests drilled for oil, but no commercial production has resulted.

Ohio.—R. L. Alkire of the Ohio Geological Survey reports that 284 gas wells were completed in 1950 compared with 292 in 1949. The average initial production of these wells was 414 thousand cubic feet per day compared with 676 thousand cubic feet in 1949. Of the total gas completions, 106 were in the Berea sand and 101 in the Clinton. Eight exploratory gas wells were completed as small gas producers. Acreage added by new pool discoveries in 1950 was negligible, totaling 1,100 acres; 500 acres in the Oriskany sand in section 25, Granger Township, Medina County, and 600 acres in the Newburg sand in section 24, Congress Township, Wayne County. Approximately 4,200 acres were added by extensions. The largest well reported during the year was completed on the L. S. Starr farm, lot 5, Litchfield Township, Medina County. Its initial daily production was 5,740 thousand cubic feet from the Clinton sand at 2611–2,623 feet.

Oklahoma.—Elmer Capshaw, Oklahoma Corporation Commission, reports that in 1950 the Oklahoma portion of the Hugoton field produced 125,890 million cubic feet of dry gas, over 40 percent of the total production from gas wells in the State. Three-quarters of this field has been developed and has 948 producing wells. The remaining quarter of the field is being developed.

The rising field price of dry gas in Oklahoma has led to the development of storage facilities and increased processing and utilization of casinghead gas.

The American Gas Association Reserves Committee reports that the net production of natural gas in Oklahoma in 1950 was 607,918 million cubic feet compared to 567,335 million in 1949. The number of gas wells completed increased from 213 in 1949 to 249 in 1950.

Pennsylvania.—J. G. Montgomery, Jr., vice president, United Natural Gas Co., reports that the most important natural-gas development in Pennsylvania in 1950 was the discovery of gas in Oriskany sands underlying the Leidy dome on the Wellsboro anticline in Clinton County. The discovery well had an initial daily open flow of 10 to 15 million cubic feet and an initial rock pressure of 4,200 pounds per square inch. By the end of the year, 12 wells with an average initial daily open flow of 17 million cubic feet had been completed, and 47 wells were being drilled. The pool was producing 150 million cubic feet per day.

In all, 410 gas wells were drilled during the year, of which 391 were in shallow sand fields. Two wells testing Cambro-Ordovician formations were being drilled in Bedford and Lycoming Counties at the end of 1950.

Tennessee.—H. C. Milhous, geologist, Tennessee Division of Geology, reports that three wildcat test wells drilled in 1950 showed gas and probably would be commercial producers except for the remoteness of their location. These were in Robertson, Sumner, and

Pickett Counties. Total gas production in 1950 was estimated at 88.5 million cubic feet, 88 percent being produced in Morgan and Scott Counties.

Texas.—The total production of natural gas in Texas, according to the Railroad Commission of Texas, increased 14 percent in 1950 to 4,024,177 million cubic feet, of which 889,850 million cubic feet were returned to formation. Production from gas wells totaled 3,099,606 million cubic feet, 77 percent of the total production. According to the Oil and Gas Journal, gas-well completions for the year totaled 647,534 development wells and 113 wildcat wells.

The Bulletin of the American Association of Petroleum Geologists, June 1951, reports that drilling in the Panhandle district resulted entirely in extending and developing known fields. Gas production declined to 860,066 million cubic feet. In South Texas production from gas wells was 725,400 million cubic feet. In this region the percentage of oil wells connected with casinghead-gas processing plants increased from 15 to 49 percent over a 4-year period.

In East Texas none of the new discoveries were expected to have major geological significance. The most productive discovery was the Sanders No. 1 in the North Jacksonville field in Cherokee County. This well had a calculated daily open-flow potential of 105 million cubic feet of gas and 1,144 barrels of condensate.

No gas discoveries in the Upper Gulf Coast region appeared to have major importance. Gas production increased to 750,674 million cubic feet in 1950, and virtually all large gas reserves in the area have been committed.

Utah.—J. R. Schwabrow, U. S. Geological Survey, reports that the only gas well drilled in Utah in 1950 was a field-use well at Ashley Creek, with a reported daily open flow of 5 million cubic feet. The Utah Natural Gas Co. filed a petition before the Utah Public Service Commission to build an intrastate natural-gas pipeline from southeastern Utah, but no decision was rendered during 1950.

Marketed production was limited to Clay Basin, as in the past. Clay Basin production was 3,950 million cubic feet compared with 6,126 million in 1949. Some gas was produced from Ashley Creek and Roosevelt fields and used in the field.

Virginia.—William M. McGill, State geologist, Virginia Geological Survey, reports that tests for natural gas in Virginia in 1950 were confined mainly to the Appalachian Plateaus section and were in Buchanan, Dickenson, Tazewell, and Wise Counties. Eleven test wells were completed as potential producers and capped; 12 were abandoned as dry holes. The potential daily production from this region is estimated at 85 million cubic feet. Production of natural gas in 1950 came entirely from the Early Grove field in Scott and Washington Counties and was reported as 82 million cubic feet for the year.

West Virginia.—Paul H. Price, State geologist of West Virginia, reports 417 gas wells as completed in 1950 compared with 427 in 1949. The initial daily open-flow gas production of these wells was 468 million cubic feet. The counties with the greatest activity in 1950 were Calhoun, Jackson, Lincoln, Mingo, Putnam, Ritchie, and Wayne.

The American Gas Association reserves committee reports that net production of natural gas in 1950 was 205,000 million cubic feet compared with 180,000 million in 1949.

Wyoming.—J. R. Schwabrow, U. S. Geological Survey, states that 20 gas wells were completed in 1950, with a total daily open flow of 160 million cubic feet. Three of these were recompletions in the Frontier at Worland, and one was recompletion in the Embar at Garland. Four deep wells were completed at Church Buttes, and two were being drilled there at the end of 1950. New fields discovered were at Deep Creek, with a total daily open flow of 3,728 thousand cubic feet from the Mesaverde and at Long's Creek with a daily open flow of 6,470 thousand cubic feet from the Phosphoria. Other completions were scattered among nine old fields.

Net production in 1950 was 78 billion cubic feet compared with 72 billion in 1949. Waste gas has been eliminated at Elk Basin, and the pipeline described in the review for Montana will eliminate most of the waste at Worland.

INTERSTATE SHIPMENTS AND EXPORTS

Interstate shipments and exports of natural gas in 1949 increased 14 percent to 2,007,878 million cubic feet. The largest producer of gas shipped interstate was Texas, whose shipments also expanded at a higher rate in 1949 than those of other major producing States. Interstate shipments increased from the major gas-producing States of the Southwest except Oklahoma; shipments declined from all the producing States in the Appalachian district. The West South Central region produced 74 percent of all gas moving interstate.

The gas from the West South Central region was consumed mainly in the East North Central (31 percent) and the West North Central regions (17 percent). The Pacific, Middle Atlantic, and South Atlantic regions showed the highest rate of increase of consumption of gas from the West South Central region.

Exports to Mexico increased from 18,511 million cubic feet in 1948 to 19,828 million in 1949. Exports to Canada increased from 193 million cubic feet in 1948 to 226 million in 1949.

TABLE 7.—Interstate shipments and exports of natural gas in 1949 by sources of shipments and State or country of final destination [1]

Producing region	Quantity shipped (million cubic feet)	Consuming State or country	Quantity received [2] (million cubic feet)
Middle Atlantic:			
New Jersey		Canada	109
New York	376	New York	14,250
Pennsylvania	14,482	Ohio	60
		Pennsylvania	294
		West Virginia	145
Total	14,858	Total	14,858
South Atlantic:			
Delaware		Canada	16
District of Columbia		District of Columbia	3,658
Florida		Maryland	1,993
Georgia		New York	8,071
Maryland		Ohio	56,047
North Carolina		Pennsylvania	51,030
South Carolina		Tennessee	25
Virginia	25	Virginia	1,778
West Virginia	122,593		
Total	122,618	Total	122,618

For footnotes, see end of table.

TABLE 7.—Interstate shipments and exports of natural gas in 1949 by sources of shipments and State or country of final destination [1]—Continued

Producing region	Quantity shipped (million cubic feet)	Consuming State or country	Quantity received [3] (million cubic feet)
East North Central:			
Illinois	------------	Illinois	33
Indiana	42	Kentucky	9
Michigan	------------		
Ohio	------------		
Wisconsin	------------		
Total	42	Total	42
East South Central:			
Alabama	------------	Alabama	22,443
Kentucky	28,825	Arkansas	42
Mississippi	48,011	Canada	2
Tennessee	------------	District of Columbia	963
		Florida	3,393
		Georgia	17,869
		Illinois	244
		Indiana	634
		Louisiana	3,703
		Maryland	430
		Mississippi	11
		Missouri	258
		New York	550
		Ohio	14,166
		Pennsylvania	3,987
		Tennessee	74
		Virginia	435
		West Virginia	7,632
Total	76,836	Total	76,836
West North Central:			
Iowa	------------	Colorado	27,220
Kansas	196,554	Illinois	6,369
Minnesota	------------	Indiana	8,149
Missouri	------------	Iowa	26,678
Nebraska	------------	Kentucky	7
North Dakota	534	Michigan	20,996
South Dakota	1	Minnesota	37,797
		Missouri	19,125
		Montana	428
		Nebraska	36,856
		Ohio	7,485
		Oklahoma	1,255
		South Dakota	3,967
		Wyoming	757
Total	197,089	Total	197,089
West South Central:			
Arkansas	1,560	Alabama	49,425
Louisiana	327,367	Arizona	23,640
Oklahoma	173,723	Arkansas	70,097
Texas	982,850	California	50,511
		Canada	99
		Colorado	45,606
		Delaware	769
		District of Columbia	5,006
		Florida	6,753
		Georgia	41,451
		Illinois	190,549
		Indiana	48,753
		Iowa	34,167
		Kansas	123,816
		Kentucky	29,336
		Louisiana	35,141
		Maryland	2,710
		Mexico	18,435
		Michigan	64,478
		Minnesota	22,199
		Mississippi	40,282
		Missouri	82,808
		Nebraska	15,838
		New Jersey	3,272
		New Mexico	15,377
		New York	29,577
		Ohio	152,559
		Oklahoma	18,586
		Pennsylvania	110,095
		South Dakota	2,266
		Tennessee	43,512

For footnotes, see end of table.

TABLE 7.—Interstate shipments and exports of natural gas in 1949 by sources of shipments and State or country of final destination [1]—Continued

Producing region	Quantity shipped (million cubic feet)	Consuming State or country	Quantity received [2] (million cubic feet)
West South Central—Continued		Texas	41,655
		Virginia	2,396
		West Virginia	61,034
		Wisconsin	1,956
		Wyoming	1,346
Total	1,485,500	Total	1,485,500
Mountain:			
Arizona		Arizona	22,634
Colorado	5,652	California	43,588
Idaho		Colorado	566
Montana	5,853	Mexico	1,393
Nevada		Montana	4,115
New Mexico	79,710	Nebraska	2,566
Utah	25	New Mexico	5,672
Wyoming	19,695	North Dakota	3,021
		South Dakota	2,154
		Texas	5,857
		Utah	18,601
		Wyoming	768
Total	110,935	Total	110,935
United States total	2,007,878	United States total	2,007,878

[1] Includes exports of 20,054 million cubic feet, of which Mexico received 19,828 million and Canada 226 million.
[2] Includes amounts consumed, stored, and lost in transmission.

PIPELINES

In 1950, $954,000,000 was spent on the construction of natural-gas transmission and distribution pipelines. During the year the Federal Power Commission approved construction of 5,750 miles of natural-gas transmission lines, which when completed will raise the total mileage of the natural-gas transmission system to more than 265,000 miles. Still pending before the Federal Power Commission at the beginning of 1951 were applications for constructing 12,400 miles of pipeline.

The world's longest gas pipeline—the 1,840 mile line of Transcontinental Gas Pipeline Corp. from Texas to New York City—was completed in 1950. Also completed was the largest-diameter line yet constructed, the 34-inch line of Pacific Gas & Electric Co. from Toprock, Ariz., to the San Francisco, Calif. area.

The Federal Power Commission in 1950 arrived at a decision on supplying natural gas to the New England States. The market was divided between Algonquin Gas Transmission Co. and Northeastern Gas Transmission Co. Distribution to New England may begin before the end of 1951.

Gas-gathering lines are to be laid under the Gulf of Mexico to collect gas produced by wells off the coast of Louisiana.

CONSUMPTION

Consumption of natural gas in the United States in 1949 was 5,195,484 million cubic feet compared with 4,945,149 million in 1948. Residential consumption increased 11 percent, commercial 8 percent, and total industrial 3 percent.

Treated for Natural Gasoline.—The quantity of natural gas processed at natural-gasoline and cycle plants increased 6 percent in 1949 to 4,656,000 million cubic feet. The pattern of previous years continued, with the volumes treated in the Southwestern States, except New Mexico, increasing and the volumes in the Appalachian and North Central States decreasing.

Residential and Commercial.—Residential consumption of natural gas increased from 896,000 million cubic feet in 1948 to 993,000 million in 1949. The number of consumers increased by about 1,200,000 to 14,690,000. A consumer of natural gas is considered as one who receives natural gas either straight, reformed, or mixed with other gases.

TABLE 8.—Consumption of natural gas in the United States, 1945–49, by States

State	Quantity: Million cubic feet, 1945	1946	1947	1948	1949	Quantity: Percent of total, 1949	Estimated value at points of consumption (thousand dollars)
Alabama	43, 417	45, 445	50, 713	61, 113	71, 072	1. 4	19, 018
Arizona	22, 488	24, 198	27, 768	34, 983	44, 489	. 8	13, 061
Arkansas	91, 198	87, 668	102, 779	112, 675	113, 922	2. 2	17, 262
California	502, 442	487, 904	548, 382	617, 615	619, 323	11. 9	209, 904
Colorado	34, 877	40, 418	49, 027	60, 585	73, 664	1. 4	21, 193
Delaware					708	(1)	619
District of Columbia	6, 883	7, 428	8, 474	9, 361	9, 305	. 2	12, 237
Florida	7, 331	7, 065	7, 891	8, 973	10, 185	. 2	1, 901
Georgia	35, 915	36, 679	41, 368	47, 552	58, 824	1. 1	18, 465
Illinois	121, 366	124, 284	132, 153	168, 796	202, 546	3. 9	92, 148
Indiana	40, 274	40, 185	42, 528	50, 774	55, 263	1. 1	31, 144
Iowa	27, 794	33, 163	40, 948	50, 350	57, 620	1. 1	21, 233
Kansas	160, 406	175, 820	191, 952	199, 893	206, 593	4. 0	43, 571
Kentucky	26, 802	29, 494	36, 938	41, 357	45, 504	. 9	19, 520
Louisiana	325, 888	331, 364	375, 206	426, 837	450, 712	8. 7	49, 675
Maryland	2, 584	2, 830	3, 402	4, 280	4, 821	. 1	5, 077
Michigan	59, 594	69, 251	80, 571	75, 978	84, 315	1. 6	65, 640
Minnesota	35, 930	37, 624	43, 198	52, 376	59, 040	1. 1	23, 995
Mississippi	38, 297	41, 778	52, 461	65, 245	60, 987	1. 2	14, 234
Missouri	72, 059	74, 257	78, 101	90, 883	99, 667	1. 9	42, 800
Montana	29, 575	28, 212	30, 919	32, 919	34, 361	. 7	9, 796
Nebraska	28, 235	33, 572	39, 699	47, 647	51, 911	1. 0	19, 815
New Jersey					3, 172	. 1	2, 955
New Mexico	71, 459	85, 662	102, 766	110, 132	127, 423	2. 4	12, 315
New York	29, 577	32, 892	41, 572	44, 200	51, 064	1. 0	41, 191
North Dakota	2, 640	2, 519	2, 608	2, 712	2, 686	. 1	1, 216
Ohio	172, 258	188, 527	221, 571	236, 137	246, 212	4. 7	132, 281
Oklahoma	249, 927	245, 981	254, 522	277, 955	258, 579	5. 0	38, 929
Pennsylvania	149, 092	158, 587	175, 906	191, 631	209, 749	4. 0	106, 514
South Dakota	7, 158	7, 526	8, 016	8, 540	8, 212	. 2	3, 327
Tennessee	24, 419	24, 344	33, 986	37, 766	41, 609	. 8	14, 229
Texas	1, 348, 140	1, 366, 457	1, 444, 422	1, 605, 955	1, 658, 379	31. 9	161, 576
Utah	40, 264	15, 733	20, 919	21, 627	24, 338	. 5	7, 699
Virginia	1, 791	2, 101	3, 055	3, 877	4, 324	. 1	4, 898
West Virginia	88, 757	100, 733	106, 105	112, 702	111, 802	2. 1	33, 083
Wisconsin		86	267	323	1, 696	(1)	1, 949
Wyoming	21, 642	23, 143	26, 351	31, 400	31, 407	. 6	6, 119
Total United States	3, 900, 479	4, 012, 930	4, 426, 544	4, 945, 149	5, 196, 484	100. 0	1, 320, 589

[1] Less than 0.5 percent.

TABLE 9.—Natural gas treated at natural-gasoline and cycle plants in the United States, 1945–49, by States, in million cubic feet

State	1945	1946	1947	1948	1949
Arkansas	55,725	53,246	60,474	60,265	59,037
California	420,482	414,881	460,046	474,607	495,843
Colorado				364	5,521
Illinois	27,690	25,161	22,720	19,545	14,918
Kansas	165,538	189,834	216,644	230,119	252,864
Kentucky	41,562	41,447	38,717	44,748	43,472
Louisiana	310,614	308,723	345,975	405,101	463,138
Michigan	4,271	3,253	2,255	1,586	1,487
Mississippi			8,079	32,325	38,365
Montana	12,000	10,000	12,066	13,615	13,876
New Mexico	116,539	123,234	130,693	177,191	174,818
New York	3	10	12	12	22
Ohio	35,210	31,898	32,869	24,366	18,351
Oklahoma	193,744	207,139	236,673	266,479	307,014
Pennsylvania	42,565	38,084	52,437	37,289	37,367
Texas	2,039,983	2,012,357	2,235,185	2,382,804	2,526,885
West Virginia	166,037	181,903	193,044	193,086	170,831
Wyoming	21,907	22,590	22,261	29,998	32,333
Total	3,653,870	3,663,760	4,070,150	4,393,500	4,656,142

The largest increases in residential consumption took place in California (17,000 million cubic feet) and Pennsylvania (16,000 million cubic feet). This increase in Pennsylvania, which is now a larger consumer of natural gas for residential use than Texas, was due mainly to the initiation in 1948 of natural-gas deliveries to Philadelphia. The rise in the number of residential consumers of natural gas was general throughout the consuming States. Largest gains were made in Pennsylvania, Wisconsin, and California. The initiation of deliveries to Wisconsin utilities by the Michigan-Wisconsin Pipeline Co. explains the large increase in the number of consumers in that State.

Commercial consumption of natural gas increased by 25,000 million cubic feet to 347,818 million in 1949. The number of consumers increased in the same proportion to 1,231,000.

Field.—Field use of natural gas increased 4 percent to 1,059,628 million cubic feet in 1949. Field use, in the individual States, tended to vary in the same direction as marketed production, except in Kentucky, Pennsylvania, and West Virginia. Here field use was greater, though marketed production declined.

Carbon-Black Manufacture.—The consumption of natural gas in the manufacture of carbon black declined 11 percent to 428,000 million cubic feet in 1949 compared with 1948. At the same time, the production of carbon black declined only 6 percent owing to the increasing quantities being produced from oil. Again in 1949 New Mexico was the only State to show an increase in the use of gas for carbon-black manufacture. The average value of gas for carbon-black production in New Mexico was well below the national average.

Petroleum Refineries.—The consumption of natural gas as fuel at petroleum refineries decreased from 441,000 million cubic feet in 1948 to 422,000 million in 1949. This reduction is not directly related to the quantity of crude oil run to stills, the largest reduction occurring in California, where crude runs increased in 1949. Smaller reductions took place in Kansas and Oklahoma. Louisiana showed an increase of 10,000 million cubic feet.

232294—53——53

TABLE 10.—Residential and commercial consumption of natural gas in the United States in 1949, by States [1]

State	Residential				Commercial				Total			
	Number of consumers	Quantity (million cubic feet)	Value at point of consumption		Number of consumers	Quantity (million cubic feet)	Value at point of consumption		Number of consumers	Quantity (million cubic feet)	Value at point of consumption	
			Total (thousand dollars)	Average (cents per M cubic feet)			Total (thousand dollars)	Average (cents per M cubic feet)			Total (thousand dollars)	Average (cents per M cubic feet)
Alabama	167,805	8,816	7,262	82.4	17,697	3,137	1,634	52.1	185,502	11,953	8,896	74.4
Arizona	98,453	5,061	4,068	80.4	12,485	5,973	2,125	35.6	110,938	11,034	6,193	56.1
Arkansas	138,355	14,229	7,049	49.5	22,878	7,015	2,531	36.1	161,233	21,244	9,580	45.1
California	2,508,894	174,811	107,226	61.3	190,960	77,800	30,910	39.7	2,699,854	252,611	138,136	54.7
Colorado	154,818	23,244	11,295	48.6	21,325	10,973	4,527	41.3	176,143	34,217	15,822	46.2
Florida	10,456	752	647	86.0	23	186	47	25.3	10,479	938	694	74.0
Georgia	152,344	13,025	8,831	67.8	15,601	6,048	2,251	37.2	167,945	19,073	11,082	58.1
Illinois	1,566,516	50,110	50,934	101.6	89,665	14,111	9,639	68.3	1,656,181	64,221	60,573	94.3
Indiana	385,880	15,101	16,457	109.0	25,476	4,242	3,722	87.7	411,356	19,343	20,179	104.3
Iowa	200,360	14,913	11,081	74.3	19,081	5,105	2,963	58.0	219,441	20,018	14,044	70.2
Kansas	325,353	38,471	18,484	48.0	37,568	19,314	6,372	33.0	362,921	57,785	24,856	43.0
Kentucky	231,325	19,776	10,955	55.4	25,867	6,035	2,856	47.3	257,192	25,811	13,811	53.5
Louisiana	360,192	21,184	12,390	58.5	36,768	11,029	3,748	34.0	396,960	32,213	16,138	50.1
Maryland, Virginia, and District of Columbia	285,028	13,455	17,469	129.8	21,740	3,047	3,239	106.3	306,768	16,502	20,708	125.5
Michigan	918,850	47,582	44,202	92.9	43,241	7,320	6,105	83.4	962,091	54,902	50,307	91.6
Minnesota	269,760	20,376	15,212	74.7	14,666	4,521	2,169	48.0	284,426	24,897	17,381	69.8
Mississippi	134,191	8,670	6,178	71.3	17,966	5,397	2,094	38.8	152,157	14,067	8,272	58.8
Missouri	533,747	38,086	27,031	71.0	29,732	8,668	3,930	45.3	563,479	46,754	30,961	66.2
Montana	66,234	11,588	5,345	46.1	6,391	6,982	2,130	30.5	72,625	18,570	7,475	40.3
Nebraska	163,076	16,249	11,106	68.4	14,559	8,344	3,341	40.0	177,635	24,593	14,447	58.7
New Jersey and Delaware	55,765	1,124	2,343	208.5	2,967	405	659	162.7	58,732	1,529	3,002	196.3
New Mexico	74,207	7,012	4,410	62.9	7,901	4,593	1,405	30.6	82,108	11,605	5,815	50.1
New York	644,864	35,813	30,821	86.1	42,595	7,839	6,007	76.6	687,459	43,652	36,828	84.4
Ohio	1,487,408	134,221	82,582	61.5	153,837	28,747	16,269	56.6	1,641,245	162,968	98,851	60.7
Oklahoma	383,666	38,220	17,169	44.9	47,559	16,974	5,365	31.6	431,225	55,194	22,534	40.8
Pennsylvania	1,477,945	85,380	57,310	67.1	108,244	16,517	9,381	56.8	1,586,189	101,897	66,691	65.4
Tennessee	109,921	9,628	7,025	73.0	14,512	4,456	2,440	54.8	124,433	14,084	9,465	67.2
Texas	1,164,634	76,057	47,312	62.2	141,573	36,845	14,511	39.4	1,306,207	112,902	61,823	54.8
West Virginia	249,294	30,539	11,892	38.9	25,286	7,603	2,713	35.7	274,580	38,142	14,605	38.3
Wyoming	35,633	5,968	2,952	49.5	5,124	3,608	1,230	34.1	40,757	9,576	4,182	43.7
Other States [2]	334,776	13,083	8,498	65.0	17,768	4,984	1,792	36.0	352,544	18,067	10,290	57.0
Total: 1949	14,689,750	992,544	665,536	67.1	1,231,055	347,818	158,105	45.5	15,920,805	1,340,362	823,641	61.4
1948	13,508,010	896,348	585,188	65.3	1,145,060	323,054	142,170	44.0	14,653,070	1,219,402	727,358	59.6

[1] Includes natural gas mixed with manufactured gas.
[2] North Dakota, South Dakota, Utah, and Wisconsin.

TABLE 11.—Industrial consumption of natural gas in the United States in 1949, by States and uses

State	Field (drilling, pumping, and operating gasoline-recovery plants)		Carbon-black manufacture			Fuel at petroleum refineries, electric utility plants, cement plants, and other industrial						Total industrial			Fuel at electric utility plants[1] (million cubic feet)
				Value at point of consumption		Million cubic feet				Value at point of consumption			Value at point of consumption		
	Million cubic feet (estimated)	Value at point of consumption (thousand dollars)	Million cubic feet	Total (thousand dollars)	Average (cents per M cubic feet)	Petroleum refineries	Portland-cement plants	Other industrial	Total	Total (thousand dollars)	Average (cents per M cubic feet)	Million cubic feet	Total (thousand dollars)	Average (cents per M cubic feet)	
Alabama						390	10,433	48,296	59,119	10,122	17.1	59,119	10,122	17.1	9,545
Arizona								33,455	33,455	6,868	20.5	33,455	6,868	20.5	10,812
Arkansas	13,589	650				9,076	(2)	[2] 70,013	79,089	7,032	8.9	92,678	7,682	8.3	14,040
California	130,218	15,277	(3)	(3)	(3)	47,527	15,280	[3] 173,687	[3] 236,494	[3] 56,491	[3] 23.9	366,712	71,768	19.6	65,342
Colorado	2,223	126				992	(2)	[2] 36,232	37,224	5,245	14.1	39,447	5,371	13.6	15,168
Florida	39	2						9,208	9,208	1,205	13.1	9,247	1,207	13.1	4,002
Georgia							(2)	[2] 39,751	39,751	7,383	18.6	39,751	7,383	18.6	22,755
Illinois	13,385	1,119				1,875		123,065	124,940	30,456	24.4	138,325	31,575	22.8	30,342
Indiana	134	8				1,485		34,301	35,786	10,957	30.6	35,920	10,965	30.5	4,729
Iowa							5,147	32,455	37,602	7,189	19.1	37,602	7,189	19.1	17,660
Kansas	22,454	1,658	(3)	(3)	(3)	7,656	10,489	[3] 108,209	[3] 126,354	[3] 17,057	[3] 13.5	148,808	18,715	12.6	34,026
Kentucky	4,717	898				850		14,126	14,976	4,811	32.1	19,693	5,709	29.0	2,605
Louisiana	152,877	8,153	20,401	914	4.5	76,735	(2)	[2] 168,486	245,221	24,470	10.0	418,499	33,537	8.0	57,665
Maryland, Virginia, and District of Columbia								1,948	1,948	1,504	77.2	1,948	1,504	77.2	21
Michigan	1,940	229				146		27,327	27,473	15,104	55.0	29,413	15,333	52.1	57
Minnesota								34,143	34,143	6,614	19.4	34,143	6,614	19.4	18,085
Mississippi	9,030	685				397		37,493	37,890	5,277	13.9	46,920	5,962	12.7	10,341
Missouri	43	7				1,291	(2)	[2] 51,579	52,870	11,832	22.4	52,913	11,839	22.4	12,691
Montana	1,791	214				1,878		12,122	14,000	2,107	15.1	15,791	2,321	14.7	871
Nebraska						128	(2)	[2] 27,190	27,318	5,368	19.7	27,318	5,368	19.7	12,418
New Jersey and Delaware								2,351	2,351	572	24.3	2,351	572	24.3	2,225
New Mexico	43,299	1,348	51,572	1,985	3.8	818		20,129	20,947	3,167	15.1	115,818	6,500	5.6	10,967
New York	262	77				12		7,138	7,150	4,286	59.9	7,412	4,363	58.9	624

Ohio	879	214				122		82,243	82,365	33,216	40.3	83,244	33,430	40.2	3,608
Oklahoma	96,740	4,134	6,914	515	7.4	28,907	(2)	[2] 70,824	99,731	11,746	11.8	203,385	16,395	8.1	33,419
Pennsylvania	6,440	2,129				532		100,880	101,412	37,694	37.2	107,852	39,823	36.9	57
Tennessee							(2)	[2] 27,525	27,525	4,764	17.3	27,525	4,764	17.3	5,242
Texas	527,916	24,001	334,161	16,207	4.9	234,955	21,094	427,351	683,400	59,545	8.7	1,545,477	99,753	6.5	147,017
West Virginia	18,657	3,501				1,780		53,223	55,003	14,977	27.2	73,660	18,478	25.1	289
Wyoming	12,995	780				4,494		4,342	8,836	1,157	13.1	21,831	1,937	8.9	1,049
Other States [4]						311	(5)	18,554	18,865	3,901	20.7	18.865	3,901	20.7	2,449
Unclassified by States			[3] 14,844	[3] 734	[3] 4.9		[2] 22,078								
Total: 1949	1,059,628	65,210	427,892	20,355	4.8	422,357	84,521	1,860,724	2,367,602	411,383	17.4	3,855,122	496,948	12.9	550,121
1948	1,021,513	61,123	480,646	22,723	4.7	441,470	72,139	1,709,979	2,223,588	382,355	17.2	3,725,747	466,201	12.5	478,097

[1] Federal Power Commission. These figures include some manufactured gas and are therefore shown separately. The natural gas component in these figures is included with "Other industrial."

[2] Gas used in portland-cement plants included under "Unclassified by States" for United States total and under "Other industrial" for State totals to avoid disclosing figures of individual operators.

[3] Gas used in carbon-black manufacture included under "Unclassified by States" for United States total and under "Other industrial" for State totals to avoid disclosing figures of individual operators.

[4] North Dakota, South Dakota, Utah, and Wisconsin.

[5] Less than 500 M cubic feet.

Electric Utility Plants.—Gas consumption by public-utility electric power plants in 1949, as reported by the Federal Power Commission, increased 15 percent over 1948 to 550,000 million cubic feet. A small amount of manufactured gas is included in this figure. The largest gain in consumption was reported for Illinois. New Jersey and Delaware used natural gas in electric utility power generation for the first time. All consuming States gained in consumption except Tennessee and West Virginia and the group of "Other States," which includes North Dakota, South Dakota, Utah, and Wisconsin.

Portland-Cement Plants.—The consumption of natural gas as fuel at portland-cement plants rose 17 percent in 1949 to 85,000 million cubic feet. At the same time, the production of portland cement increased by only 2 percent. Alabama reported the largest increase in consumption. No State showed a decline.

Other Industrial.—The consumption of natural gas by industries other than petroleum refining and cement manufacture increased 9 percent to 1,861,000 million cubic feet. Largest gains were made by Texas, increasing 62,000 million cubic feet, and Illinois, increasing 27,000 million. New Mexico was the only State that showed a substantial loss of "Other industrial" sales, which declined 16 percent. New Jersey and Delaware reported industrial consumption for the first time. Michigan and New York lost industrial sales in 1948 but regained them in 1949.

Mixed Gas.—Both the quantity of natural gas used with manufactured gas and the number of consumers of mixed gas in 1949 increased over 1948. Conversions to straight natural gas have eliminated all mixed-gas sales in Minnesota, most of them in Ohio, and a substantial quantity in New York. In Delaware and New Jersey natural gas, available for the first time in 1949, is distributed mixed.

TABLE 12.—Consumption of natural gas used with manufactured gas in the United States in 1949, by States

State	Residential		Commercial		Industrial (million cubic feet)	Total	
	Number of consumers	Million cubic feet	Number of consumers	Million cubic feet		Million cubic feet	Value at point of consumption (thousand dollars)
Illinois	1,210,677	27,005	60,323	8,293	15,243	50,541	35,199
Indiana	159,411	4,162	8,907	1,076	5,691	10,929	8,677
Iowa	23,165	711	2,337	169	77	957	1,100
Kentucky	96,495	6,101	9,352	2,301	4,539	12,941	6,036
Michigan	5,357	29	192	6	10	45	50
Missouri	296,713	11,067	10,593	1,862	2,009	14,938	16,123
Nebraska	1,369	44	138	15	----------	59	53
New Jersey and Delaware	40,757	1,068	2,149	390	2,319	3,777	3,363
New York	333,249	13,592	20,373	2,506	1,660	17,758	13,456
Ohio	----------	270	1,028	79	30	379	395
Pennsylvania	735,995	17,540	55,421	2,564	3,345	23,449	19,280
Tennessee	1,370	15	100	10	----------	25	44
Virginia	690	9	198	11	----------	20	32
Total: 1949	2,905,248	81,613	171,111	19,282	34,923	135,818	103,808
1948	2,798,410	70,806	160,430	17,745	25,847	114,398	83,827

PRICES

The average value at wells for natural gas in the United States declined 0.2 cent in 1949 to 6.3 cents per thousand cubic feet. The decline resulted from an increased proportion of total marketed production being produced in the low-value, larger producing States and from price declines in a number of the smaller producing States. The average value, however, increased in five of the seven States with largest marketed production.

The average value of natural gas at point of consumption in 1949 increased 1.3 cents per thousand cubic feet to 25.4 cents per thousand. The percentage gain in unit value on a United States total basis was about 3 percent for each class of consumer—residential, commercial, and industrial.

TABLE 13.—Average value of natural gas in the United States, by States, 1948–49, in cents per thousand cubic feet

State	At wells (estimated)		At points of consumption		State	At wells (estimated)		At points of consumption	
	1948	1949	1948	1949		1948	1949	1948	1949
Alabama			24.9	26.8	Montana	4.6	5.6	27.4	28.5
Arizona			30.2	29.4	Nebraska			35.9	38.2
Arkansas	4.5	4.0	14.4	15.2	New Jersey				93.2
California	11.3	11.8	33.5	33.9	New Mexico	2.7	2.9	10.0	9.7
Colorado	6.0	5.2	29.4	28.8	New York	22.1	24.6	75.3	80.7
Delaware				87.4	North Dakota	3.0	5.2	44.3	45.3
District of Columbia			126.7	131.5	Ohio	19.7	19.3	53.4	53.7
Florida	3.7	4.1	19.7	18.7	Oklahoma	4.9	4.7	14.0	15.1
Georgia			33.0	31.4	Pennsylvania	24.1	25.6	46.1	50.8
Illinois	12.3	11.3	47.1	45.5	South Dakota	6.5	6.3	37.4	40.5
Indiana	9.8	7.4	54.8	56.4	Tennessee	9.4	9.1	35.2	34.2
Iowa			36.7	36.9	Texas	4.5	4.6	9.2	9.7
Kansas	5.0	5.4	20.2	21.1	Utah	6.0	6.0	30.3	31.6
Kentucky	18.4	19.1	41.7	42.9	Virginia	9.5	7.7	114.8	113.3
Louisiana	3.9	4.4	10.8	11.0	West Virginia	16.7	16.2	28.4	29.6
Maryland			103.3	105.3	Wisconsin			118.6	114.9
Michigan	14.7	15.2	72.0	77.9	Wyoming	5.9	5.6	18.8	19.5
Minnesota			39.6	40.6					
Mississippi	5.6	6.2	21.4	23.3	Total	6.5	6.3	24.1	25.4
Missouri	18.5	16.7	38.9	42.9					

WORLD REVIEW

Canada.—Gross production of natural gas in the Province of Alberta in 1950 was 75.6 billion cubic feet, an increase of 13 percent over 1949. The first development of the Jumping Pound field took place in 1950. Discovered in 1944, it had been shut in for lack of market. A natural-gasoline plant is under construction here, and another was completed at Devon to operate on casinghead gas from the Leduc field.

The Petroleum and Natural Gas Conservation Board of Alberta issued an interim report on the question of exporting gas from the Province. It estimated reserves for Alberta at 4.4 trillion cubic feet of gas economically recoverable and available for use away from the field. These reserves were thought to be sufficient only to meet the expected needs of the Province of Alberta, and the Board therefore declined to issue export permits until further reserves had been proved.

Italy.—The production of natural gas in Italy in 1950 approximated 16 billion cubic feet, more than a 100-percent increase over 1949.

TABLE 14.—Consumption of natural gas, by countries, 1944–49, in million cubic meters

[United Nations Statistical Yearbook]

Country	1944	1945	1946	1947	1948	1949 [1]
Western Hemisphere:						
Argentina	662	609	562	(2)	(2)	(2)
Canada	1,276	1,371	1,356	1,491	1,660	2,122
Ecuador	64	70	66	87	(2)	(2)
Mexico	729	762	768	997	1,066	1,198
United States	108,030	114,457	117,594	129,753	145,776	153,471
Venezuela	5,089	7,257	9,381	11,402	13,319	14,134
Europe:						
Austria	149	(2)	(2)	(2)	(2)	(2)
Czechoslovakia	1	2	3	(2)	(2)	(2)
Denmark	4	4	3	3	(2)	(2)
France	66	85	110	147	174	228
Germany [3]	59	71	109	78	67	54
Hungary	78	77	91	101	(2)	(2)
Italy	49	42	64	94	117	236
Poland	(2)	[4] 102	149	148	[5] 81	(2)
Rumania	930	1,304	1,332	[1] 1,176	(2)	(2)
Yugoslavia	(2)	3	6	12	9	8
Asia:						
Brunei	(2)	(2)	[1] 28	25	562	(2)
China [6]	60	(7)	61	55	(2)	(2)
Indonesia	(2)	(2)	(2)	24	369	591
Japan	44	41	36	35	51	58
Total [8]	118,000	127,000	132,000	147,000	165,000	(2)

[1] Preliminary or estimated figures.
[2] Data not available.
[3] American and British Zones.
[4] April–December.
[5] January–June.
[6] Beginning 1945, industries under control of the National Resources Commission.
[7] Less than 500,000 cubic meters.
[8] Excluding U. S. S. R, where natural-gas consumption was last reported as 1,400 million cubic meters in 1936.

Completion of pipeline construction to be started in 1951 will give Azienda Generale Italiana Petroli, the Government-controlled oil company, 840 miles of line with a daily capacity of 353 million cubic feet. This company and its subsidiaries in 1950 produced over half of the natural gas in Italy.

Mexico.—The completed 20-inch pipeline from Veracruz to Mexico City delivered 30 million cubic feet per day to Mexico City for industrial use in 1950. Proved reserves of natural gas at the end of 1949 were reported to be 1.2 trillion cubic feet. Daily production of gas at the end of 1950 was 400 million cubic feet compared with 164 million at the end of 1949.

Venezuela.—A natural-gas pipeline was started in October 1950 from the producing region around Las Mercedes and Tucupido to Caracas. Production of natural gas in 1949 approximated 500 billion cubic feet.

Natural Gasoline
and Liquefied Petroleum Gases[1]

By D. S. Colby, E. M. Seeley, A. T. Coumbe, and I. F. Avery

GENERAL SUMMARY

PRODUCTION of natural-gas liquids increased to 7,625 million gallons in 1950, an all-time high and 16 percent above 1949. LP-gases[2] showed the largest growth, with an increase of 24 percent for the year.

The average yield of all light products rose from 1.42 gallons per thousand cubic feet in 1949 to 1.44 gallons in 1950. The gain was due almost entirely to increased recovery of propane; the yield of natural gasoline declined.

In 1950, 5,283 billion cubic feet of gas were treated at natural-gasoline and cycle plants compared with 4,656 billion in 1949. Operable plants on January 1, 1950 (latest biennial survey), had a production capacity of 27 million gallons of natural-gas liquids daily.

Total demand for natural-gas liquids in 1950 was 7,690,041 thousand gallons, an increase of 14 percent. Shipments to refineries totaled 4,143,693 thousand gallons. The proportion of these products blended into refinery gasoline increased from 9.1 percent in 1949 to 9.5 percent in 1950. The primary market for LP-gases—direct sale for fuel use—took 2,051 million gallons in 1950, a 26-percent increase.

TABLE 1.—Salient statistics of the natural-gasoline industry in the United States, 1946–50, in thousands of gallons

	1946	1947	1948	1949	1950 [1]
Production:					
Natural gasoline and natural-gasoline mixtures	2,691,001	2,743,731	2,979,412	3,008,879	3,311,445
LP-gases:					
Isobutane	164,015	206,184	196,354	175,625	194,230
Other LP-gases	1,245,330	1,685,634	2,012,717	2,254,881	2,825,333
Finished gasoline and naphtha	355,113	431,743	528,935	700,609	795,596
Other products	405,574	483,975	444,869	457,619	498,862
Total	4,861,033	5,551,267	6,162,287	6,597,613	7,625,466
Receipts from outside sources	118,850	122,705	172,333	181,264	72,559
Total new supply [2]	4,979,883	5,673,972	6,334,620	6,778,877	7,698,025
Stock change at plants and terminals	33,996	−26,481	49,924	35,714	7,984

For footnotes, see end of table.

[1] Data for 1950 preliminary.
[2] Liquefied petroleum gases.

TABLE 1.—Salient statistics of the natural-gasoline industry in the United States, 1946–50, in thousands of gallons—Continued

	1946	1947	1948	1949	1950 [1]
Shipments to refineries:					
Natural gasoline and natural-gasoline mixtures	2,438,416	2,554,494	2,757,680	2,769,500	3,041,704
LP-gases	381,175	407,206	431,926	513,486	553,890
Other products	412,905	477,001	491,015	468,398	548,099
Shipments to jobbers and trade outlets:					
Natural gasoline	157,523	177,848	172,579	183,554	246,842
LP-gases:					
For fuel	860,619	1,212,648	1,495,588	1,631,929	2,051,277
For chemical manufacture	209,394	242,280	285,165	285,314	361,150
Finished gasoline and naphtha	265,819	361,182	371,333	541,951	645,992
Condensate	11,205	7,131	8,407	8,850	4,763
Transfers of cycle products [3]	52,990	71,576	80,402	103,747	122,931
Exports from plants	121,781	156,114	153,238	173,953	51,118
Losses	34,060	32,973	37,363	62,481	62,275
Total demand at plants and terminals	4,945,887	5,700,453	6,284,696	6,743,163	7,690,041
Stocks at plants, terminals, and refineries:					
Natural gasoline	138,667	118,346	151,571	172,207	175,833
LP-gases	32,264	30,225	44,147	49,228	69,774
Other products	38,278	31,847	38,614	65,453	63,293
Total	209,209	180,418	234,332	286,888	308,900
Value at plants:					
Natural gasoline ____ thousand dollars	111,798	171,057	257,125	211,487	224,304
LP-gases ____ do	36,079	66,820	117,823	99,054	94,516
Finished gasoline and naphtha ____ do	34,404	57,117	52,414	60,551	66,569
Other products ____ do			31,615	31,098	32,311
Average per gallon ____ cents	3.7	5.3	7.4	6.1	5.5
Natural gas treated ____ millions of cubic feet	3,663,760	4,070,150	4,393,500	4,656,142	5,282,980
Average yield, light products except LP-gases per M cubic feet ____ gallons	0.94	0.90	0.90	0.89	0.87
Average yield, all light products ____ do	1.33	1.36	1.40	1.42	1.44
Sales to consumers for fuel and chemical uses:					
LP-gases	1,039,688	1,448,807	1,766,017	1,917,243	2,421,002
LR-gases [4]	664,574	760,990	970,784	919,356	1,061,565
Total	1,704,262	2,209,797	2,736,801	2,836,599	3,482,567
Exports of natural gasoline and LP-gases	177,875	256,160	216,294	236,650	109,703

[1] Preliminary figures.
[2] Differs from previously published figures by amount of stock change.
[3] "Other products" not used as motor fuel.
[4] Liquefied refinery gases.

Stocks of all natural-gas liquids at plants, terminals, and refineries on December 31, 1950, totaled 309 million gallons, an increase of 22 million gallons during the year, mostly of LP-gas stocks.

The total value at plants of all natural-gas liquids produced in 1950 was $417,700,000, an increase in overall value despite the decline in average value to 5.5 cents per gallon from 6.1 cents in 1949. Market prices for both natural gasoline and LP-gas in 1950 averaged below 1949 prices despite the rising trend in the latter part of 1950.

Exports totaled 110 million gallons compared with 237 million in 1949. The decline took place entirely in exports of natural gasoline. Exports of LP-gases increased.

RESERVES

The American Petroleum Institute and the American Gas Association reserves committee estimated proved recoverable reserves of natural-gas liquids in the United States at the end of 1950 to be 4,267,663,000 barrels, an increase of 538,651,000 barrels over 1949.

New discoveries were lower than in 1949, while extensions and revisions of estimates of old fields added more reserves in 1950 than at any time since these estimates were initiated in 1947. Over half of the total addition to reserves was due to extensions and revisions of the reserves of Texas. Extensions to reserves in California and Kansas were unusually high in 1950. The downward revision of estimates of Colorado reserves caused the largest indicated decline of reserves in any State.

TABLE 2.—Estimated proved recoverable reserves of natural-gas liquids [1] in the United States, 1949–50, in thousands of barrels

[Committee on Natural Gas Reserves, American Gas Association]

State	Reserves as of Dec. 31, 1949	Changes in reserves during 1950			Reserves as of Dec. 31, 1950			
		Extensions and revisions	Discoveries of new fields and new pools in old fields	Net production	Nonassociated	Associated	Dissolved	Total
Arkansas	55,642	745	230	3,679	31,997	7,586	13,355	52,938
California	320,275	71,079	250	28,217	----------	137,492	225,895	363,387
Colorado	24,190	−10,837	----------	432	873	----------	12,048	12,921
Illinois	26,666	3,003	28	3,438	28	75	26,156	26,259
Indiana	126	34	24	32	20	25	107	152
Kansas	106,405	60,578	341	3,746	159,702	1,594	2,282	163,578
Kentucky	13,245	308	154	1,780	[2] 11,927	----------	----------	11,927
Louisiana	596,422	56,492	18,992	28,394	498,484	97,437	47,591	643,512
Michigan	1,203	−75	14	124	609	----------	409	1,018
Mississippi	56,407	2,040	100	2,650	26,558	23,295	6,044	55,897
Montana	3,710	81	----------	244	3,547	----------	----------	3,547
Nebraska	37	65	140	7	74	107	54	235
New Mexico	85,719	11,773	1,370	4,965	30,876	33,211	29,810	93,897
Ohio	1,670	108	12	102	[2] 1,688	----------	----------	1,688
Oklahoma	234,030	61,897	4,922	20,946	121,708	24,868	133,327	279,903
Pennsylvania	2,643	135	68	247	[2] 2,599	----------	----------	2,599
Texas	2,143,711	443,190	31,326	122,188	1,434,654	359,067	702,318	2,496,039
Utah	208	−9	----------	5	194	----------	----------	194
West Virginia	12,831	634	212	4,701	[2] 8,976	----------	----------	8,976
Wyoming	43,863	6,636	----------	1,512	37,675	6,390	4,922	48,987
Alabama and Florida	9	2	----------	2	----------	----------	9	9
Total	3,729,012	707,879	58,183	227,411	2,372,189	691,147	1,204,327	4,267,663

[1] Comprises natural gasoline, LP-gases, and condensate.
[2] Not allocated by types, but occurring principally in column shown.

PRODUCTION

The production of natural gasoline and allied products in 1950 again exceeded all previous outputs. Total liquid production was 7,625,466 thousand gallons, 16 percent above 1949. Production of liquids at cycle plants increased only 9 percent to 1,877,392 thousand gallons in 1950. Production of natural-gas liquids in the last half of 1950 exceeded 1949 production by a greater margin than in the first half.

By type of product, the increases in production compared to 1949 were 10 percent for natural gasoline, 24 percent for LP-gases, 14 percent for finished gasoline and naphtha, and 9 percent for other products. LP-gases in 1950 constituted 40 percent of the total production of natural-gas liquids, whereas in 1941 they constituted just over 20 percent.

TABLE 3.—Natural gasoline and allied products produced and natural gas treated in the United States, 1949–50, by States

State	Number of operators [2]	Production										Natural gas treated		
		Natural gasoline		LP-gases		Finished gasoline and naphtha		Other products [1]		Total		Million cubic feet	Average yield (gallons per M cubic feet)	
		Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars	Thousand gallons	Thousand dollars		Light products except LP-gases	All light products
1949														
Arkansas	8	55,011	3,664	35,821	1,492	2,530	257	2,386	159	95,748	5,572	59,037	1.02	1.62
California	30	734,150	58,143	276,582	19,553	---	---	129,721	9,264	1,140,453	86,960	495,843	1.74	2.30
Colorado	1	6,400	463	7,957	281	---	---	---	---	14,357	744	5,521	1.16	2.60
Illinois	8	38,003	3,533	97,144	4,941	---	---	---	---	135,147	8,474	14,918	2.55	9.06
Kansas	10	78,953	4,772	32,235	1,164	---	---	---	---	111,188	5,936	252,864	.31	.44
Kentucky	3	8,479	595	59,575	1,591	---	---	---	---	68,054	2,186	43,472	.20	1.57
Louisiana	25	328,529	24,552	223,356	9,573	132,569	12,218	124,225	8,489	808,679	54,832	463,138	1.26	1.75
Michigan	3	3,628	196	---	---	---	---	---	---	3,628	196	1,487	2.44	2.44
Mississippi	1	29,712	2,074	20,798	572	---	---	2,868	190	53,378	2,836	38,365	.85	1.39
Montana	1	3,602	210	6,060	431	---	---	---	---	9,662	641	13,876	.26	.70
New Mexico	9	114,771	7,724	54,275	1,462	---	---	9	4	169,055	9,190	174,818	.66	.97
New York	1	7	1	---	---	---	---	---	---	7	1	22	.31	.31
Ohio	5	4,709	394	---	---	451	38	---	---	5,160	432	18,351	.28	.28
Oklahoma	39	277,823	19,162	236,472	8,408	10,103	1,198	---	---	524,398	28,768	307,014	.94	1.71
Pennsylvania	15	9,561	683	698	45	---	---	---	---	10,259	728	37,367	.26	.27
Texas	99	1,239,131	79,428	1,247,561	45,108	552,651	46,672	195,936	12,824	3,235,279	184,032	2,526,885	.79	1.28
Utah	---	423	36	---	---	---	---	---	---	423	36	---	---	---
West Virginia	14	38,738	2,726	116,060	3,591	2,305	168	837	51	157,940	6,536	170,831	.25	.92
Wyoming	5	37,249	3,131	15,912	842	---	---	1,637	117	54,798	4,090	32,333	1.20	1.69
Total	220	3,008,879	211,487	2,430,506	99,054	700,609	60,551	457,619	31,098	6,597,613	402,190	4,656,142	.89	1.42

1950[3]														
Arkansas	8	53,591	3,344	39,437	1,216	2,884	294	2,457	164	98,369	5,018	62,097	.95	1.58
California	30	741,006	54,316	292,724	13,495	268	19	150,481	10,534	1,184,479	78,364	506,724	1.76	2.34
Colorado	1	8,013	510	7,096	224	---	---	---	---	15,109	734	7,880	1.02	1.92
Illinois	8	41,255	2,880	88,446	4,183	---	---	---	---	129,701	7,063	13,910	2.97	9.32
Kansas	11	105,518	6,120	48,321	1,474	---	---	4	(4)	153,843	7,594	345,830	.31	.44
Kentucky	3	10,432	684	64,751	1,664	---	---	---	---	75,183	2,348	48,537	.21	1.55
Louisiana	25	328,579	22,179	250,447	8,140	157,337	13,594	124,500	8,441	860,863	52,354	538,446	1.13	1.60
Michigan	3	3,283	154	---	---	---	---	---	---	3,283	154	1,173	2.80	2.80
Mississippi	1	30,319	2,122	22,356	863	---	---	1,552	98	54,227	3,083	45,141	.71	1.20
Montana	1	4,116	350	6,324	450	---	---	---	---	10,440	800	15,017	.27	.70
New Mexico	9	127,723	8,915	86,263	2,053	---	---	126	6	214,112	10,974	191,931	.67	1.12
New York	1	1	(4)	---	---	---	---	---	---	1	(4)	13	.08	.08
Ohio	4	4,326	344	---	---	---	---	---	---	4,326	344	19,390	.22	.22
Oklahoma	35	315,974	20,444	283,359	7,990	10,599	1,494	6,891	532	616,823	30,460	323,977	1.03	1.90
Pennsylvania	11	9,786	696	578	36	---	---	---	---	10,364	732	37,479	.26	.28
Texas	100	1,441,938	95,156	1,655,998	47,527	622,105	51,013	210,306	12,387	3,930,347	206,083	2,908,910	.78	1.35
Utah	---	472	35	---	---	---	---	---	---	472	35	---	---	---
West Virginia	14	43,236	2,944	152,745	4,262	2,403	155	1,023	49	199,407	7,410	177,374	.26	1.12
Wyoming	6	41,877	3,111	20,718	939	---	---	1,522	100	64,117	4,150	39,151	1.11	1.64
Total	211	3,311,445	224,304	3,019,563	94,516	795,596	66,569	498,862	32,311	7,625,466	417,700	5,282,980	.87	1.44

1 Includes condensate, kerosine, distillate fuel, etc.
2 A producer operating in more than 1 State is counted but once in arriving at total for United States.
3 Preliminary figures.
4 Less than $500.

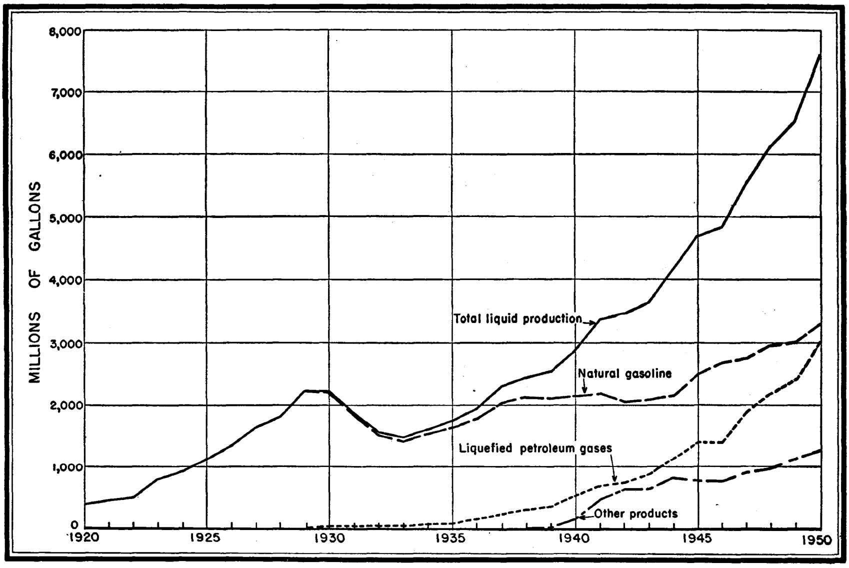

FIGURE 1.—Production of the natural-gasoline industry, 1920–50.

REVIEW BY STATES

California.—The production of all natural-gas liquids in 1950 totaled 1,184,479 thousand gallons, a 4-percent increase over 1949 but below the national average gain.

Louisiana.—The production of natural-gas liquids in the Gulf area of Louisiana declined 2 percent in 1950. Output in this district has been declining since 1947. The Inland area produced 12 percent more natural-gas liquids than in 1950. Total production in Louisiana for 1950 was 860,863 thousand gallons. There was virtually no change in the volume of natural gasoline and "other products" produced compared with 1949; production of LP-gases and "finished gasoline and naphtha" increased 12 and 19 percent, respectively.

Oklahoma.—The production of natural-gas liquids in Oklahoma increased 18 percent in 1950 to 616,823 thousand gallons. Natural-gasoline output increased 14 percent compared with a 4-percent increase in 1949. The production of LP-gases and "finished gasoline and naphtha" increased 20 and 5 percent, respectively.

Texas.—The output of all natural-gas liquids in Texas in 1950 increased 21 percent to 3,930,347 thousand gallons. The largest gain was made in the production of LP-gases, which increased 33 percent to 1,655,998 thousand gallons. Texas in 1950 produced 52 percent of all natural-gas liquids and 55 percent of all LP-gases in the country.

Other States.—The States showing above-average gains in the production of natural-gas liquids in 1950 were Kansas, New Mexico, West Virginia, and Wyoming. In all these States the predominant increases percentagewise were in the production of LP-gases. States reporting decreases in output were Illinois, Michigan, New York, and Ohio.

TABLE 4.—Monthly production of natural gasoline and allied products in the United States, 1949–50 by States and districts [1] in millions of gallons

State and district	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1949													
West New York and West Pennsylvania	1.1	0.9	1.0	0.8	0.8	0.8	0.6	0.7	0.6	0.7	1.1	1.2	10.3
West Virginia	13.3	13.1	14.2	13.7	13.6	11.9	11.0	11.3	13.2	13.1	14.4	15.1	157.9
Ohio	.5	.5	.4	.4	.4	.3	.3	.4	.5	.5	.5	.5	5.2
Illinois	12.1	10.5	11.6	11.2	10.7	10.5	11.2	11.6	11.4	11.8	11.2	11.3	135.1
Kentucky	6.3	5.3	5.8	5.6	5.0	4.6	5.0	5.6	5.7	6.5	6.2	6.4	68.0
Michigan	.2	.1	.2	.3	.4	.4	.3	.3	.4	.4	.3	.3	3.6
Kansas	9.3	8.4	8.6	8.8	8.0	7.6	7.4	8.2	9.5	11.3	12.0	12.1	111.2
Oklahoma	43.3	39.0	41.0	38.7	40.4	37.8	42.9	45.0	46.6	49.7	49.2	50.8	524.4
Texas:													
Gulf	70.5	63.2	69.2	66.7	66.8	63.8	67.8	69.8	69.4	71.2	73.2	73.6	825.2
East Texas	30.9	31.4	30.2	26.2	28.8	27.9	26.4	27.8	28.5	30.8	31.9	29.4	350.2
Panhandle	50.5	52.4	51.3	50.7	51.9	44.4	47.6	50.4	49.5	54.9	57.7	64.0	625.3
Rest of State	106.9	99.3	108.0	105.6	105.7	106.8	112.7	125.8	134.0	137.3	142.9	149.6	1,434.6
Total Texas	258.8	246.3	258.7	249.2	253.2	242.9	254.5	273.8	281.4	294.2	305.7	316.6	3,235.3
Arkansas	8.7	8.0	8.3	8.1	7.9	7.1	7.2	7.1	7.4	8.2	8.7	9.0	95.7
Louisiana:													
Gulf	31.3	25.8	29.5	28.6	29.7	28.2	27.1	28.9	26.1	28.3	29.3	26.5	339.3
Inland	42.3	37.8	39.5	37.9	37.4	36.7	36.9	38.5	38.1	40.0	40.2	44.1	469.4
Total Louisiana	73.6	63.6	69.0	66.5	67.1	64.9	64.0	67.4	64.2	68.3	69.5	70.6	808.7
Mississippi	4.6	4.1	4.1	4.4	4.2	4.0	4.4	4.6	4.3	5.0	4.8	4.9	53.4
New Mexico	12.0	11.9	12.9	12.0	12.5	13.4	14.4	14.6	15.6	16.2	16.7	16.9	169.1
Montana	1.1	1.0	1.0	.7	.7	.6	.5	.5	.7	1.0	.8	1.1	9.7
Colorado, Utah, Wyoming	4.9	4.6	5.2	5.5	5.5	5.3	6.3	6.3	6.2	6.7	6.8	6.3	69.6
California	98.4	92.0	97.1	94.8	96.0	92.4	94.6	94.6	93.2	95.8	93.9	97.6	1,140.4
Total United States	548.2	509.3	539.1	520.7	526.4	504.5	524.6	552.0	560.9	589.4	601.8	620.7	6,597.6
Daily average	17.7	18.2	17.4	17.4	17.0	16.8	16.9	17.8	18.7	19.0	20.1	20.0	18.1
1950 [2]													
West New York and West Pennsylvania	1.2	1.0	1.1	1.0	0.8	0.7	0.7	0.6	0.6	0.7	1.0	1.0	10.4
West Virginia	15.8	14.2	15.5	14.8	14.2	17.4	16.3	17.0	18.0	18.6	17.8	19.8	199.4
Ohio	.4	.4	.4	.4	.4	.3	.3	.3	.3	.4	.3	.4	4.3
Illinois	11.1	9.7	10.6	10.4	11.1	10.9	10.6	11.5	11.0	11.1	10.9	10.8	129.7
Kentucky	6.9	6.3	7.1	6.3	5.8	4.7	5.4	5.5	5.7	6.6	7.3	7.6	75.2
Michigan	.3	.2	.3	.3	.3	.3	.3	.3	.3	.3	.2	.2	3.3
Kansas	14.6	13.4	12.3	12.0	11.8	11.4	10.7	10.6	11.6	13.3	15.1	17.0	153.8
Oklahoma	50.5	47.2	50.2	48.4	48.3	47.2	49.4	52.7	52.9	56.2	55.1	58.7	616.8
Texas:													
Gulf	82.2	76.8	79.7	75.4	76.7	75.3	81.9	84.9	83.9	88.1	87.4	95.3	987.6
East Texas	28.3	25.1	29.3	29.0	29.3	31.3	33.2	33.4	35.2	37.7	34.5	34.2	380.5
Panhandle	64.3	53.2	56.8	56.3	56.0	52.2	46.2	51.6	51.9	58.4	58.8	66.4	672.1
Rest of State	146.7	135.1	141.9	142.8	144.6	147.8	167.0	166.0	167.5	176.9	172.9	181.0	1,890.2
Total Texas	321.5	290.2	307.7	303.5	306.6	306.6	328.3	335.9	338.5	361.1	353.6	376.9	3,930.4
Arkansas	9.2	8.4	8.9	8.5	8.2	7.8	7.9	8.0	7.7	8.2	8.1	7.5	98.4
Louisiana:													
Gulf	31.9	25.9	30.9	21.8	22.4	24.6	26.0	28.6	29.0	29.9	30.5	32.1	333.6
Inland	41.4	39.3	43.9	43.0	42.2	41.3	43.1	43.5	42.2	46.8	48.7	51.9	527.3
Total Louisiana	73.3	65.2	74.8	64.8	64.6	65.9	69.1	72.1	71.2	76.7	79.2	84.0	860.9
Mississippi	4.7	4.2	4.5	4.4	4.5	4.4	4.4	4.7	4.4	4.6	4.7	4.7	54.2
New Mexico	17.0	15.3	17.4	17.3	18.1	17.5	17.6	19.8	19.0	18.7	17.9	18.5	214.1
Montana	1.1	1.0	1.1	.9	.8	.6	.6	.6	.7	.8	1.0	1.2	10.4
Colorado, Utah, Wyoming	5.7	5.4	5.8	5.7	6.4	6.2	6.8	6.9	7.3	7.8	7.7	8.0	79.7
California	100.7	88.6	94.2	89.3	95.7	96.0	101.0	102.1	100.1	106.6	102.6	107.6	1,184.5
Total United States	634.0	570.7	611.9	588.0	597.6	597.9	629.4	648.6	649.3	691.7	682.5	723.9	7,625.5
Daily average	20.5	20.4	19.7	19.6	19.3	19.9	20.3	20.9	21.6	22.3	22.8	23.4	20.9

[1] West New York and West Pennsylvania separated from east part of States to allow grouping either according to Bureau of Mines refinery districts or according to Petroleum Administration for War districts. Districts shown for Texas and Louisiana are Bureau of Mines production districts.

[2] Preliminary figures.

YIELDS, PROCESSES, AND NUMBER OF PLANTS

Cycle Plants.—The yield of natural-gas liquids recovered at cycle plants declined for the second consecutive year in 1950 to 1.49 gallons per thousand cubic feet. In the two preceding years the yield had been 1.54 and 1.60 gallons per thousand cubic feet. In 1950, 1,263,714 thousand cubic feet of gas were treated at cycle plants, from which 1,877,392 thousand gallons of liquids were recovered.

Yields.—The average yield of all light products continued its slow rise in 1950. This rise in over-all yield was due entirely to the increased yield of LP-gases, which in 1950 averaged 0.57 gallon per thousand cubic feet compared with 0.52 in 1949; propane alone accounted for 0.04 of this 0.05-gallon-per-thousand-cubic-feet increase. The yield of all products averaged 1.44 gallons per thousand cubic feet, up from 1.42 in 1949, while the average yield of all products except

TABLE 5.—Natural gasoline and allied products produced in the United States in 1949 by States and by methods of manufacture [1]

State	Number of plants operating				Production (thousands of gallons)			
	Compression [2]	Absorption [3]	Cycling [4]	Total	Compression [2]	Absorption [3]	Cycling [4]	Total
Arkansas		8		8		95,748		95,748
California	2	77	2	81	216	934,421	205,816	[5] 1,140,453
Colorado		1		1		14,357		14,357
Illinois	6	6		12	217	134,930		135,147
Kansas	2	14		16	939	110,249		111,188
Kentucky	1	3		4	760	67,294		68,054
Louisiana	3	30	7	40	35,042	262,392	511,245	808,679
Michigan	2	1		3	1,988	1,640		3,628
Mississippi			2	2			53,378	53,378
Montana		1		1		9,662		9,662
New Mexico	2	9		11	6,979	162,076		169,055
New York	1			1	7			7
Ohio	3	7		10	11	5,149		5,160
Oklahoma	13	67		80	9,894	514,504		524,398
Pennsylvania	21	6		27	751	9,508		10,259
Texas	24	135	35	194	123,237	2,166,812	945,230	3,235,279
Utah						[6] 423		423
West Virginia	34	18		52	84,310	73,630		157,940
Wyoming	2	5		7	2,994	51,804		54,798
Total: 1949	116	388	46	550	267,345	4,614,599	1,715,669	6,597,613
1948	131	376	41	548	257,458	4,315,774	1,589,055	6,162,287

[1] Figures for 1950 not yet available.
[2] Includes 21 plants manufacturing LP-gases.
[3] Includes combination of absorption process with compression and charcoal processes. Includes 236 plants manufacturing LP-gases; and 3 charcoal plants in West Virginia and Ohio with 932,000 gallons produced in 1949 and 3 charcoal plants with 1,664,000 gallons produced in 1948.
[4] Includes 36 plants manufacturing LP-gases.
[5] Includes 38,346,000 gallons of field condensate.
[6] Drip gasoline.

LP-gases declined from 0.89 gallon to 0.87 gallon per thousand cubic feet.

The average value of liquids recovered per thousand cubic feet of natural gas treated declined from 8.6 cents in 1949 to 7.9 cents in 1950. The decline in value of natural gasoline recovered per thousand cubic feet—from 4.5 cents in 1949 to 4.2 in 1950—was due both to price decline and lowered recovery. The decline in value of LP-gases recovered per thousand cubic feet—from 2.1 cents to 1.8—was due entirely to a price decline.

Production, by Processes.—The total number of plants, natural-gasoline and cycle, operating in 1949 was 550, a net increase of 2 over 1948. The number of operating compression-type plants continued to decline, most of the shut-downs occurring in Pennsylvania and West Virginia. The number of operating absorption plants increased by 12 to 388, and the number of cycle plants increased by 5 to 46.

MARKET DEMAND—SHIPMENTS

Total demand at plants and terminals for natural-gas liquids was 7,690,041 thousand gallons in 1950, a 14-percent increase. Sizable gains were made in the demand for all classes of products. Natural gasoline increased 11 percent, condensate 10 percent, finished gasoline and naphtha 21 percent and LP-gases 22 percent.

Shipments to Refineries.—Shipments of natural-gas liquids to refineries increased 10 percent in 1950 to 4,143,693 thousand gallons. Natural-gasoline shipments increased 10 percent, normal butane shipments 13 percent, and "other LP-gases" 39 percent, while isobutane and isopentane shipments decreased 4 and 23 percent, respectively. Indicated shipments of finished gasoline and naphtha increased 30 percent. This figure is substantially influenced by the sales methods of companies operating both gasoline plants and refineries, and a change in the figure does not necessarily indicate an operational change.

TABLE 6.—Supply and distribution at plants and terminals [1] of natural gasoline and allied products in the United States, 1949–50, by months, in thousands of gallons

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Production:													
Natural gasoline and natural-gasoline mixtures	236,276	217,142	246,466	242,686	257,824	251,307	259,557	260,852	258,822	262,962	258,640	256,345	3,008,879
LP-gases:													
Butane, normal	47,748	50,804	52,112	50,015	48,555	48,023	49,924	53,150	54,474	57,667	59,555	61,328	633,355
Isobutane	12,871	12,726	14,937	14,491	16,153	14,212	14,216	14,599	14,289	16,302	15,619	15,210	175,625
Propane	82,859	78,113	71,250	60,917	57,151	54,054	58,133	64,716	73,625	85,932	91,441	103,903	882,094
Butane-propane mixture	49,331	44,939	39,781	39,884	33,440	31,567	35,173	39,237	42,395	45,137	48,471	54,842	504,197
Other LP-gas mixtures	16,722	14,969	18,022	15,885	15,202	13,050	13,824	13,729	13,376	15,146	16,577	16,869	183,371
Isopentane	4,630	3,575	4,622	3,914	4,903	4,906	3,694	5,154	3,513	5,648	4,606	2,699	51,864
Finished gasoline and naphtha	56,861	50,251	50,647	54,036	54,038	49,788	54,117	60,986	64,377	65,703	67,369	72,436	700,609
Condensate, raw	32,624	28,227	32,084	30,025	31,152	30,286	27,418	30,061	27,074	25,879	29,523	27,046	351,399
Other products	8,301	8,586	9,201	8,805	7,945	7,345	8,561	9,463	8,908	9,020	10,040	10,045	106,220
Total	548,223	509,332	539,122	520,658	526,363	504,538	524,617	551,947	560,853	589,396	601,841	620,723	6,597,613
Receipts from outside sources [2]	22,077	19,158	14,546	13,280	12,968	9,238	14,180	11,559	17,914	13,294	15,719	17,331	181,264
Total new supply	570,300	528,490	553,668	533,938	539,331	513,776	538,797	563,506	578,767	602,690	617,560	638,054	6,778,877
Stock change at plants and terminals	22,810	25,723	16,017	−14,076	5,971	−18,592	18,340	−19,797	8,173	−11,597	10,661	−7,919	35,714
Shipments to refineries (for motor fuel):													
Natural gasoline and natural-gasoline mixtures	216,150	202,618	202,433	229,090	233,504	227,028	236,601	239,812	235,755	261,794	242,809	241,906	2,769,500
Butane, normal	15,239	18,855	23,292	20,628	20,915	16,698	20,205	17,627	17,823	21,933	21,308	23,537	238,060
Isobutane	11,456	11,713	13,290	13,146	14,154	13,139	12,435	12,726	12,122	13,623	12,937	12,764	153,505
Isopentane	3,785	4,179	3,622	3,399	4,200	4,845	4,379	5,164	3,785	4,455	4,052	3,890	49,755
Other LP-gases	6,066	6,406	7,255	6,917	5,794	5,135	5,748	5,513	5,837	5,158	5,904	6,433	72,166
Finished gasoline and naphtha	12,566	11,551	12,239	12,008	11,122	11,235	11,911	11,973	11,241	12,284	11,762	12,559	142,451
Condensate	28,071	24,626	27,490	27,531	27,912	28,312	26,125	30,236	26,510	24,131	28,210	26,793	325,947
Shipments to jobbers and trade outlets:													
Natural gasoline	12,461	12,358	12,635	14,604	14,408	18,836	18,371	16,328	15,468	15,991	17,598	14,496	183,554
LP-gases:													
For fuel [3]	157,254	134,167	124,279	123,143	105,120	103,223	107,871	131,163	138,259	154,237	172,529	194,697	1,645,942
For chemical manufacture	25,076	22,678	25,337	23,026	23,689	22,167	22,109	23,483	23,581	24,602	24,838	24,728	285,314
Finished gasoline and naphtha	37,782	30,206	44,215	38,590	46,777	47,929	36,540	50,070	49,928	52,756	51,239	55,919	541,951
Condensate	1,429	1,690	1,140	628	495	515	437	508	487	489	544	488	8,850
Transfers of cycle products [4]	8,927	9,387	8,518	6,887	7,407	9,313	7,697	9,800	7,354	7,236	9,393	11,828	103,747
Export and losses [3]	11,228	12,333	31,906	28,417	17,863	23,993	10,028	28,900	22,444	15,598	3,776	15,935	222,421
Total demand at plants and terminals	547,490	502,767	537,651	548,014	533,360	532,368	520,457	583,303	570,594	614,287	606,899	645,973	6,743,163

23294—53——54

1950													
Production:													
Natural gasoline and natural-gasoline mixtures	261,170	231,057	256,665	259,773	271,456	281,463	292,266	294,008	287,047	299,139	283,396	294,005	3,311,445
LP-gases:													
Butane, normal	62,704	54,051	56,856	52,062	50,440	50,888	53,022	54,035	58,296	62,908	63,859	61,050	680,171
Isobutane	15,266	12,793	15,009	13,494	14,565	14,664	14,133	17,351	18,122	20,360	19,336	19,137	194,230
Propane	110,534	102,478	99,104	93,156	90,247	79,033	85,894	91,353	99,970	112,188	116,823	133,614	1,214,394
Butane-propane mixture	56,565	50,246	52,487	51,878	46,251	43,948	45,892	56,839	49,848	54,388	57,195	67,156	632,693
Other LP-gas mixtures	17,395	15,802	17,093	16,151	18,897	23,733	24,350	23,023	24,698	25,931	23,607	24,519	255,199
Isopentane	4,103	3,231	4,868	1,768	3,769	2,348	2,843	3,071	3,479	4,215	4,520	4,661	42,876
Finished gasoline and naphtha	65,494	59,531	68,055	64,947	64,255	63,281	68,182	63,462	65,831	69,307	70,611	72,640	795,596
Condensate, raw	30,756	32,213	31,372	25,069	27,930	28,844	31,902	35,424	31,824	32,750	32,403	34,490	374,977
Other products	10,009	9,256	10,388	9,669	9,785	9,741	10,907	9,998	10,156	10,509	10,809	12,658	123,885
Total	633,996	570,658	611,897	587,967	597,595	597,943	629,391	648,564	649,271	691,695	682,559	723,930	7,625,466
Receipts from outside sources [2]	16,221	9,706	3,944	3,760	769	724	465	6,898	5,693	6,234	6,511	11,634	72,559
Total new supply	650,217	580,364	615,841	591,727	598,364	598,667	629,856	655,462	654,964	697,929	689,070	735,564	7,698,025
Stock change at plants and terminals	17,615	34,250	−8,667	−2,677	−23,101	5,594	17,860	2,233	−769	−3,013	−21,508	−9,833	7,984
Shipments to refineries (for motor fuel):													
Natural gasoline and natural-gasoline mixtures	240,135	212,904	228,100	241,875	257,425	241,900	252,252	256,797	263,949	284,479	276,119	285,769	3,041,704
Butane, normal	20,919	19,637	20,102	18,869	15,988	17,436	20,424	23,297	23,693	28,432	31,430	27,612	267,839
Isobutane	11,870	10,659	11,821	10,691	11,619	11,244	10,618	12,314	12,494	15,611	14,096	13,978	147,015
Isopentane	3,878	2,977	3,662	2,658	2,837	2,128	2,562	2,431	3,540	4,408	4,401	3,063	38,545
Other LP-gases	6,307	6,913	6,857	6,001	9,038	10,477	9,485	7,622	8,993	10,251	8,764	9,783	100,491
Finished gasoline and naphtha	12,111	11,426	11,799	12,411	11,621	10,828	18,340	19,686	19,118	18,362	19,052	20,102	184,856
Condensate	29,941	27,752	31,240	23,278	26,896	30,342	32,273	32,905	31,464	31,773	32,292	33,087	363,243
Shipments to jobbers and trade outlets:													
Natural gasoline	14,439	14,172	19,461	20,857	27,680	24,229	19,246	23,142	21,123	21,859	20,938	19,696	246,842
LP-gases:													
For fuel [3]	198,600	165,479	178,440	160,246	148,307	136,664	139,275	173,882	160,495	183,040	198,260	223,588	2,066,276
For chemical manufacture	24,215	23,168	27,730	26,090	27,358	31,089	32,593	31,800	35,183	33,333	31,573	36,418	361,150
Finished gasoline and naphtha	52,535	36,910	67,658	54,709	62,753	57,750	52,883	52,194	48,792	51,799	55,524	52,485	645,992
Condensate	507	382	518	389	464	672	363	291	315	235	305	322	4,763
Transfers of cycle products [4]	12,247	10,628	10,101	8,957	9,291	8,654	10,858	8,751	8,684	9,320	11,367	14,073	122,931
Exports and losses [3]	4,898	3,107	7,019	6,773	10,188	9,660	10,824	8,117	17,890	8,040	6,457	5,421	98,394
Total demand at plants and terminals	632,602	546,114	624,508	594,404	621,465	593,073	611,996	653,229	655,733	700,942	710,578	745,397	7,690,041

1 Terminals owned by producers.
2 Mainly straight-run gasoline from refineries.
3 Of the total exports from plants and terminals, 14,013,000 gallons in 1949 and 14,999,000 in 1950 are included with shipments of LP-gases for fuel and are excluded from exports and losses. This portion of the exports is not separable by months.
4 "Other products" not sold as motor fuel.
5 Preliminary figures.

TABLE 7.—Natural gasoline and allied products utilized at refineries in the United States, 1949–50, by Bureau of Mines refinery districts and months, in thousands of gallons

District	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
East Coast	7,864	9,870	4,074	3,822	3,528	3,948	8,526	4,032	4,284	7,140	8,610	5,292	70,980
Appalachian	3,066	1,974	1,932	1,806	1,428	1,470	1,680	1,638	1,722	2,184	1,806	2,268	22,974
Indiana, Illinois, Kentucky, etc	28,896	29,652	31,920	34,650	35,910	30,366	33,306	42,378	36,750	38,304	25,788	26,922	394,842
Oklahoma, Kansas, Missouri	25,200	25,242	25,074	26,796	29,022	24,696	28,098	29,484	29,904	33,222	31,752	30,492	338,982
Texas:													
Gulf Coast	64,512	53,130	59,178	51,576	69,258	78,288	66,948	67,620	74,718	75,936	73,458	73,752	808,374
Inland	40,446	50,064	43,470	48,510	56,616	58,044	52,248	46,242	47,880	67,074	54,978	54,558	620,130
Total Texas	104,958	103,194	102,648	100,086	125,874	136,332	119,196	113,862	122,598	143,010	128,436	128,310	1,428,504
Louisiana-Arkansas:													
Louisiana Gulf Coast	17,388	13,230	14,364	13,398	15,246	15,330	16,128	17,346	16,422	15,834	19,782	21,000	195,468
Arkansas, Louisiana Inland	2,856	2,394	2,940	1,974	2,982	3,108	3,024	3,318	2,856	2,814	3,192	3,528	34,986
Total Louisiana-Arkansas	20,244	15,624	17,304	15,372	18,228	18,438	19,152	20,664	19,278	18,648	22,974	24,528	230,454
Rocky Mountain	4,452	2,856	4,284	4,242	6,300	3,528	3,990	4,662	6,048	6,174	5,292	4,872	56,700
California	78,204	76,776	88,998	81,984	83,832	87,654	91,350	90,678	93,156	99,960	88,200	84,966	1,045,758
Total United States	272,874	265,188	276,234	268,758	304,122	306,432	305,298	307,398	313,740	348,642	312,858	307,650	3,589,194
1950 [1]													
East Coast	4,242	15,624	10,500	9,240	12,432	20,832	20,790	24,948	16,758	23,016	20,706	18,942	198,030
Appalachian	2,226	1,806	1,806	1,764	1,512	1,344	1,554	1,554	1,344	1,596	1,386	1,848	19,740
Indiana, Illinois, Kentucky, etc	30,660	28,224	33,306	33,306	34,734	38,472	34,062	37,548	30,996	38,598	39,774	34,104	413,784
Oklahoma, Kansas, Missouri	30,660	24,654	27,342	28,350	28,644	22,260	18,396	25,830	30,324	38,094	34,608	32,340	341,502
Texas:													
Gulf Coast	77,196	68,208	80,220	70,392	61,908	70,308	75,012	98,616	99,624	99,162	96,852	104,370	1,001,868
Inland	51,786	41,706	53,046	48,636	45,108	36,036	37,884	38,640	52,920	54,390	52,290	50,106	562,548
Total Texas	128,982	109,914	133,266	119,028	107,016	106,344	112,896	137,256	152,544	153,552	149,142	154,476	1,564,416
Louisiana-Arkansas:													
Louisiana Gulf Coast	20,916	18,480	14,532	15,288	16,716	14,322	15,540	14,868	17,766	18,144	19,446	18,438	204,456
Arkansas, Louisiana Inland	3,696	3,318	5,292	5,376	4,872	5,376	6,090	5,124	3,738	4,200	4,200	5,880	57,162
Total Louisiana-Arkansas	24,612	21,798	19,824	20,664	21,588	19,698	21,630	19,992	21,504	22,344	23,646	24,318	261,618
Rocky Mountain	5,208	4,746	4,242	3,738	4,158	3,696	3,360	3,864	4,998	6,594	7,476	6,426	58,506
California	79,128	77,700	78,498	77,238	88,662	94,836	102,564	106,428	99,372	106,890	99,918	106,008	1,117,242
Total United States	305,718	284,466	308,784	293,328	298,746	307,482	315,252	357,420	357,840	390,684	376,656	378,462	3,974,838

[1] Preliminary figures.

The quantity of natural gasoline and allied products utilized at refineries in the United States in 1950 was 3,974,838 thousand gallons. This represents an 11-percent increase in the refinery use of these products and an increase in the percentage of natural gasoline and allied products in refinery gasoline from 9.1 percent in 1949 to 9.5 percent in 1950. The largest percentage increases in consumption of these products at refineries were in the East Coast and Arkansas-Louisiana Inland regions.

TABLE 8.—Percentage of natural gasoline and allied products in refinery gasoline in the United States 1946–50 by Bureau of Mines refinery districts

Year	East Coast	Appalachian	Indiana, Illinois, Kentucky	Oklahoma, Kansas, Missouri	Texas Inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas, Louisiana Inland	Rocky Mountain	California	Total
1946	1.2	1.9	5.0	7.9	22.7	8.8	5.1	16.6	4.7	15.4	8.4
1947	.8	2.0	5.5	7.7	22.6	8.8	5.3	10.3	3.9	17.4	8.7
1948	.8	2.4	5.0	8.9	25.0	8.3	4.8	7.1	3.8	17.2	8.5
1949	1.5	2.0	5.3	9.5	27.6	8.5	6.0	7.5	4.5	18.4	9.1
1950 [1]	3.5	1.7	5.0	8.3	26.0	10.7	5.9	13.8	4.1	19.0	9.5

[1] Preliminary figures.

"Direct" Sales.—The largest market for LP-gases is direct fuel use. Shipments to jobbers and trade outlets for this use increased 26 percent in 1950 to 2,051,277 thousand gallons. The use of LP-gases for chemical manufacture was rising throughout the year and averaged 27 percent higher than in 1949.

Shipments of natural gasoline to jobbers, while still relatively small, increased 34 percent in 1950 to 246,842 thousand gallons.

The relative importance of various modes of transport carrying gasoline and cycle-plant products from the producing plants remained constant in 1949 compared to 1948. Pipelines carried 50 percent of the total shipments; tank cars, 24 percent; tank trucks, 21 percent; barges, 2 percent; and miscellaneous (which includes direct retail sales and company use), 3 percent.

SALES OF LP-GASES[3]

Sales of LP-gas, which showed only a nominal increase in 1949 compared with 1948, turned sharply upward in 1950, when deliveries of 3,482,567,000 gallons were nearly a quarter (23 percent) above the 1949 total of 2,836,599,000. Illustrating the rapid growth in the market for LP-gas is the fact that 1950 sales about tripled the demand in 1945 and doubled the 1946 quantity. Exports of LP-gas increased from 53,383,000 gallons in 1949 to 67,763,000 in 1950, a 27-percent gain, according to figures published by the Bureau of the Census, United States Department of Commerce.

Sales of LP-gas were shown only by marketing districts [4] in 1948 and 1949; a State breakdown of the market is available for the first

[3] LP-gases, as used in this section, includes LR- (liquid refinery) gases as well. The survey covering sales of LP-gases in the Pacific Coast marketing area (district 5) was made by E. T. Knudsen, chief, Petroleum Statistics Branch, Bureau of Mines, Los Angeles, Calif.

[4] Petroleum Administration for War districts. For a list of the States in each district, *see* footnote to table 11.

time in 1950. Gains in requirements for LP-gas in 1950 were reported for all areas of the country, except district 5, where there was a 4-percent decline in the quantity compared with 1949. Outstanding increases in sales in 1950 were reported for district 1, where deliveries were 57 percent over the 1949 total, and also for districts 2 and 4, where requirements were up 21 and 39 percent, respectively, over 1949 demands.

TABLE 9.—Sales of LP-gases [1] in the United States 1946–50 by type of gas

Year	Butane		Propane		Butane-propane mixture		Total	
	Thousand gallons	Percent of total	Thousand gallons	Percent of total	Thousand gallons	Percent of total	Thousand gallons	Increase over previous year, percent
1946	441,418	25.9	551.250	32.3	711,594	41.8	1,704,262	33.5
1947	398,635	18.0	863,686	39.1	947,476	42.9	2,209,797	29.7
1948	512,615	18.7	1,279,744	46.8	944,442	34.5	2,736,801	23.8
1949	488,801	17.2	1,403,359	49.5	944,439	33.3	2,836,599	3.6
1950	568,038.	16.3	1,938,301	55.7	976,228	28.0	3,482,567	22.8

[1] Data include LR-gases.

TABLE 10.—Sales of LP-gases [1] in the United States 1945–50 by use in thousands of gallons

Year	Domestic and commercial	Chemical	Synthetic rubber	Industrial	Gas manufacturing	Internal combustion	All other	Total
1945	533,262	224,291	208,787	163,121	53,849	93,340	116	1,276,766
1946	758,466	311,499	293,892	159,115	86,660	94,592	38	1,704,262
1947	1,150,538	414,267	201,535	173,601	169,332	99,786	738	2,209,797
1948	1,473,289	524,350	225,641	180,518	237,638	92,941	2,424	2,736,801
1949	1,627,550	544,886	177,850	162,197	239,210	77,981	6,925	2,836,599
1950	2,034,464	612,468	228,485	217,078	251,694	129,818	8,560	3,482,567

[1] Data include LR-gases.

Distributors reported sales of 1,938,301,000 gallons of propane in 1950, a gain of 38 percent over the 1949 total of 1,403,359,000 gallons. The proportion of propane in the LP-gas total, because of its expanding supply, continued the upward trend of recent years and represented about 56 percent of all deliveries in 1950 compared with a 50-percent share in 1949. Butane covered in the survey increased from 488,-801,000 gallons in 1949 to 568,038,000 in 1950, a gain of 16 percent; however, the butane proportion in the total sales declined from 17 percent in 1949 to 16 in 1950. Sales of butane-propane mixtures rose by 3 percent, or from 944,439,000 gallons in 1949 to 976,228,000 in 1950, while the relative share of these mixtures in the LP-gas total declined from 33 percent in 1949 to 28 percent in 1950.

A greater demand for propane was indicated for all principal uses in 1950 compared with 1949. The quantities of butane reported for gas-company distribution, industrial fuel, and internal-combustion-engine fuel in 1950 were below those for 1949, while sales of butane for domestic (household) and commercial uses and to synthetic rubber and chemical plants were above comparative items for 1949. Domestic and commercial establishments, chemical plants, and internal-combustion engines used more butane-propane mixtures in 1950 than in 1949, while quantities reported for other principal uses were below the 1949 level.

TABLE 11.—Sales of LP-gases [1] in the United States, 1949–50, by use and P. A. W. district [2] in thousands of gallons

Use and district [3]	Butane		Propane		Butane and propane mixture		Total LP-gases		Percent increase, 1949 to 1950
	1949	1950	1949	1950	1949	1950	1949	1950	
Domestic and commercial:									
District 1	19,927	11,430	223,146	363,642	39,173	66,831	282,246	441,903	56.6
District 2	44,149	46,092	359,194	566,701	124,129	102,825	527,472	715,618	35.7
District 3	73,823	111,479	142,168	129,269	354,730	385,916	570,721	626,664	9.8
District 4	13,895	7,044	29,463	56,214	6,244	1,237	49,602	64,495	30.0
District 5	2,805	2,598	100,485	101,934	94,219	81,252	197,509	185,784	−5.9
Total	154,599	178,643	854,456	1,217,760	618,495	638,061	1,627,550	2,034,464	25.0
Gas manufacturing:									
District 1	18,656	17,442	47,681	72,304	4,790	3,694	71,127	93,440	31.4
District 2	37,421	20,207	74,265	87,493	16,278	5,381	127,964	113,081	−11.6
District 3	1,730	978	3,099	6,337	3,456	4,594	8,285	11,909	43.7
District 4	1,353	284	310	5,479	955	153	2,618	5,916	126.0
District 5	2,341	2,013	19,528	20,734	7,347	4,601	29,216	27,348	−6.4
Total	61,501	40,924	144,883	192,347	32,826	18,423	239,210	251,694	5.2
Industrial:									
District 1	4,495	4,502	43,855	75,683	1,352	2,081	49,702	82,266	65.5
District 2	35,404	34,263	45,120	61,645	5,300	3,743	85,824	99,651	16.1
District 3	1,050	1,511	1,524	16,307	7,262	7,212	9,836	25,030	154.5
District 4	1,147	--------	174	1,133	--------	143	1,321	1,276	−3.4
District 5	1,247	722	9,063	6,289	5,204	1,844	15,514	8,855	−42.9
Total	43,343	40,998	99,736	161,057	19,118	15,023	162,197	217,078	33.8
Synthetic rubber:									
District 1	121	--------	--------	353	7	--------	128	353	175.8
District 2	21,816	--------	--------	410	1	--------	21,817	410	−98.1
District 3	124,496	215,219	--------	--------	19,855	--------	144,351	215,219	49.1
District 4	--------	--------	--------	--------	--------	--------	--------	--------	--------
District 5	10,174	1,080	1,380	11,423	--------	--------	11,554	12,503	8.2
Total	156,607	216,299	1,380	12,186	19,863	--------	177,850	228,485	28.5
Chemical:									
District 1	1,780	6,067	388	39,607	84,599	108,109	86,767	153,783	77.2
District 2	--------	993	5,109	7,516	46,745	52,141	51,854	60,650	17.0
District 3	46,983	63,277	243,571	239,249	80,021	73,135	370,575	375,661	1.4
District 4	--------	--------	--------	--------	--------	--------	--------	--------	--------
District 5	7,713	158	27,977	4,087	--------	18,129	35,690	22,374	−37.3
Total	56,476	70,495	277,045	290,459	211,365	251,514	544,886	612,468	12.4
Internal combustion:									
District 1	--------	90	24	1,454	1,633	794	1,657	2,338	41.1
District 2	10,958	4,985	9,999	19,005	17,338	13,587	38,295	37,577	−1.9
District 3	1,878	9,389	2,443	7,687	11,051	26,666	15,372	43,742	184.6
District 4	5	356	115	2,110	6	307	126	2,773	2,100.8
District 5	2,152	74	7,683	33,569	12,696	9,745	22,531	43,388	92.6
Total	14,993	14,894	20,264	63,825	42,724	51,099	77,981	129,818	66.5
All other:									
District 1	1	--------	123	53	2	22	126	75	−40.5
District 2	1,252	5,503	1,326	299	12	--------	2,590	5,802	124.0
District 3	29	107	4,146	97	34	2,068	4,209	2,272	−46.0
District 4	--------	--------	--------	200	--------	--------	--------	200	--------
District 5	--------	175	--------	18	--------	18	--------	211	--------
Total	1,282	5,785	5,595	667	48	2,108	6,925	8,560	23.6

For footnotes, see end of table.

TABLE 11.—Sales of LP-gases [1] in the United States, 1949–50, by use and P. A. W. district [2] in thousands of gallons—Continued

Use and district [1]	Butane		Propane		Butane and propane mixture		Total LP-gases		Percent increase, 1949 to 1950
	1949	1950	1949	1950	1949	1950	1949	1950	
Total all uses:									
District 1	44,980	39,531	315,217	553,096	131,556	181,531	491,753	774,158	57.4
District 2	151,000	112,043	495,013	743,069	209,803	177,677	855,816	1,032,789	20.7
District 3	249,989	401,960	396,951	398,946	476,409	499,591	1,123,349	1,300,497	15.8
District 4	16,400	7,684	30,062	65,136	7,205	1,840	53,667	74,660	39.1
District 5	26,432	6,820	166,116	178,054	119,466	115,589	312,014	300,463	−3.7
Total sales for U. S. use	488,801	568,038	1,403,359	1,938,301	944,439	976,228	2,836,599	3,482,567	22.8
Exports	(3)	(3)	(3)	(3)	(3)	(3)	53,383	67,763	26.9
Grand total	(3)	(3)	(3)	(3)	(3)	(3)	2,889,982	3,550,330	22.8

1 Data include LR gases.
2 The States in each district are as follows:
District 1.—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida.
District 2.—North Dakota, South Dakota, Minnesota, Nebraska, Iowa, Wisconsin, Illinois, Indiana, Michigan, Ohio, Kentucky, Tennessee, Missouri, Kansas, Oklahoma.
District 3.—New Mexico, Texas, Arkansas, Louisiana, Mississippi, Alabama.
District 4.—Idaho, Montana, Wyoming, Utah, Colorado.
District 5.—California, Oregon, Washington, Arizona, Nevada.
3 Not available by type of gas.

Domestic (Household) and Commercial Uses.—Distributors reported sales of 2,034,464,000 gallons of LP-gas for domestic and commercial uses in 1950, a 25-percent gain over the 1949 quantity of 1,627,550,000 gallons, which in turn exceeded 1948 requirements by 10 percent. Most of the LP-gas sold for domestic and commercial fuel is propane (60 percent of the total in 1950 and 53 percent in 1949); the quantity increased from 854,456,000 gallons in 1949 to 1,217,760,000 in 1950—a gain of 43 percent. Butane and propane mixtures for domestic and commercial use in 1950—638,061,000 gallons—were only slightly above the 1949 total of 618,495,000 gallons, and the proportionate share declined from 38 percent in 1949 to 31 percent in 1950. Butane delivered for household fuel increased from 154,599,000 gallons in 1949 to 178,643,000 in 1950—a 16-percent gain—and represented about 9 percent of total requirements in both years.

Important gains in sales of LP-gas for domestic and commercial fuel in 1950 were reported for districts 1, 2, and 4 (*see* table 12). In district 1 the increase was outstanding—57 percent—and the proportionate share for the area increased from about 17 percent of the national total in 1949 to 22 percent in 1950. The quantity of liquefied gas delivered for domestic fuel in district 2 was larger by 36 percent in 1950 over 1949, even though a growing use of natural gas was a competitive factor in the area. Sales in this district increased from 33 percent of the total domestic demand in 1949 to 35 percent in 1950. Deliveries of LP-gas for household use in district 4 are not relatively important (about 3 percent of the national total); however, they showed a 30-percent gain in 1950 over 1949. The largest share (35 percent in 1949 and 31 percent in 1950) of the LP-gas delivered for domestic fuel was reported for district 3; however, there was a gain of only 10 percent in sales in that area in 1950 over 1949, probably because it has used LP-gas for a longer time and is possibly near the saturation point for this type of domestic fuel. A wide distribution of natural gas in the area is also a factor. The Pacific Coast marketing area (district 5) was the only section of the country to show lower sales—down 6 percent—of LP-gas for domestic use in 1950. This loss was partly attributed to competitive natural gas piped in from Texas and to milder weather. LP-gas sold in district 5 for household fuel represented 12 percent of the national total in 1949 and 9 percent in 1950.

Gas-Company Use.—LP-gas sold to gas companies for enriching manufactured gas and for direct distribution through mains increased from 239,210,000 gallons in 1949 to 251,694,000 in 1950—a 5-percent gain, which compares with a 1-percent expansion in 1949 over 1948. Most of the LP-gas delivered to gas companies is propane (76 percent of the total in 1950 and 61 in 1949), and the quantity increased by a third from 144,883,000 gallons in 1949 to 192,347,000 in 1950. Butane sold to gas companies declined by a third from 61,501,000 gallons in 1949 to 40,924,000 in 1950, while mixtures were lower by 44 percent, dropping from 32,826,000 gallons in 1949 to 18,423,000 in 1950.

Sales of LP-gas to gas companies in 1950 showed gains in districts 1, 3, and 4 and declines in the other areas of the country. In district 1 the liquid gas delivered to gas companies in 1950 was 31 percent above the 1949 demand, and the proportion for the area rose from 30 percent of the national total in 1949 to 37 percent in 1950. Quantities credited to gas companies in districts 3 and 4 are not relatively important; however, their purchases of LP-gas in these areas expanded greatly in 1950 over 1949. Although over half (about 54 percent) of the LP-gas going to gas companies in 1949 was credited to district 2, the demand declined by 12 percent in 1950—probably due to competition with natural gas—and the relative share for the area dropped to 45 percent of the national total. Gas companies operating in district 5 bought 6 percent less LP-gas in 1950 than in 1949, and their requirements declined from 12 percent of the national total in 1949 to 11 percent in 1950.

The American Gas Association has reviewed the distribution of LP-gas by gas companies in 1950 as follows:

> As of June 1, 1951, liquefied petroleum gas was being delivered through mains in 402 communities in 39 States by 185 utilities. Butane air gas and propane air gas with heating values ranging from 525 to 1,600 B. t. u. per cubic foot were supplied in 338 of these communities in 36 States. Undiluted butane vapors or mixtures of butane and propane vapors were distributed in 10 communities in Arizona, California and New Mexico. Undiluted propane gas was supplied in 54 communities in Connecticut, Iowa, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New Mexico, North Carolina, South Carolina, Virginia and Wisconsin. An average of 326,800 customers, of which 298,400 were residential, received liquefied petroleum gas from utilities during 1950 * * *.

Industrial-Plant Use.—Industrial plants purchased 217,078,000 gallons of LP-gas in 1950, a third more than the 1949 total (162,197,000 gallons). Propane sold to industrial establishments increased by 62 percent, or from 99,736,000 gallons in 1949 to 161,057,000 in 1950. The 1950 totals for butane (40,998,000 gallons) and butane-propane (15,023,000) were below the 1949 levels (43,343,000 and 19,118,000 gallons, respectively).

Plants in districts 1 and 2 use most of the LP-gas sold for industrial fuel; quantities reported for these areas were up by 66 and 16 percent, respectively, in 1950 over 1949. Relatively small amounts of LP-gas are delivered to industrial plants in other parts of the country; there was a substantial gain in the quantity for district 3 in 1950 and declines for districts 4 and 5.

Synthetic Rubber Components.—A stepped-up synthetic rubber-manufacturing program, ordered by the Government after the start of hostilities in Korea in June 1950, was reflected in expanded sales of LP-gas for synthetic-rubber components. Distributors reported the delivery of 228,485,000 gallons of LP-gas to synthetic-rubber plants in 1950, a gain of 28 percent over the 1949 total of 177,850,000 gallons. Virtually all (95 percent in 1950 and 88 percent in 1949) of the LP-gas used for making synthetic rubber was butane, and the quantity increased from 156,607,000 gallons in 1949 to 216,299,000 in 1950—a 38-percent gain. A small amount of propane is also shipped to synthetic-rubber plants; this rose from 1,380,000 gallons in 1949 to 12,186,000 in 1950. There were 19,863,000 gallons of butane-propane mixtures sold for synthetic rubber manufacture in 1949, but no sales were reported in 1950.

Virtually all of the LP-gas sold for the manufacture of synthetic rubber is reported for district 3, and sales in that area increased by nearly a half from 144,351,000 gallons in 1949 to 215,219,000 in 1950. Quantities sold in other areas for synthetic-rubber components are relatively unimportant.

Raw Material and Solvents for Chemical Manufactures.—Suppliers reported sales of 612,468,000 gallons of LP-gas to chemical-manufacturing plants in 1950, or 12 percent over the 1949 total of 544,886,000 gallons. About half of this chemical raw material (51 percent in 1949 and 47 percent in 1950) was propane, and the quantity increased by 5 percent from 277,045,000 gallons in 1949 to 290,459,000 in 1950. Butane-propane mixtures, which made up about 40 percent of the chemical-plant total for both 1949 and 1950, rose in volume from 211,365,000 gallons in 1949 to 251,514,000 in 1950, a 19-percent gain.

Most of the LP-gas credited to chemical plants (68 percent of the total in 1949 and 61 percent in 1950) was reported for district 3, and the quantity for that area increased from 370,575,000 gallons in 1949 to 375,661,000 in 1950. Greatly increased activity in chemical plants operating in district 1 is indicated in their purchases of LP-gas for raw material, which rose from 86,767,000 gallons in 1949 to 153,783,000 in 1950. Less-important quantities were credited to district 2, where requirements for chemical plants also gained in 1950 over 1949, and district 5, where the demand declined in 1950.

Internal-Combustion-Engine Fuel.—The use of LP-gas for motor fuel, especially for farm and other heavy equipment, has recently been vigorously advocated to find a summer market for propane. The fact that this campaign is expanding the market for LP-gas is indicated in the quantities reported sold for motor fuel in 1950—129,818,000 gallons, a total well above 1949 sales of 77,981,000 gallons. However, before 1950 only producers of LP-gas reported the distribution of their sales, but for 1950 dealers were also asked to cooperate in the survey; the numerous distributors who sold direct

TABLE 12.—Sales of LP-gases[1] 1950, by States and uses, in thousands of gallons

PAW district and State	Domestic and commercial	Gas manufacturing	Industrial	Synthetic rubber	Chemical	Internal combustion	All other	Total	Percent of total
District 1									
Connecticut	20, 031	7, 186	13, 684	-------	-------	590	------	41, 491	5. 4
Delaware	6, 770	783	315	-------	-------	-------	------	7, 868	1. 0
Florida	54, 241	4, 515	436	-------	-------	347	22	59, 561	7. 7
Georgia	43, 835	6, 569	2, 254	-------	4	520	20	53, 202	6. 9
Maine	12, 516	734	182	-------	-------	55	------	13, 487	1. 7
Maryland & D. C	21, 640	3, 684	1, 705	-------	-------	-------	------	27, 029	3. 5
Massachusetts	21, 967	14, 616	1, 614	-------	-------	-------	1	38, 198	4. 9
New Hampshire	9, 177	382	179	-------	-------	-------	------	9, 738	1. 2
New Jersey	35, 017	12, 880	23, 446	-------	2, 787	-------	------	74, 130	9. 6
New York	61, 306	7, 914	3, 277	-------	1, 517	-------	10	74, 024	9. 6
North Carolina	36, 031	12, 455	1, 579	-------	-------	243	12	50, 320	6. 5
Pennsylvania	38, 471	10, 403	19, 740	71	10, 979	21	10	79, 695	10. 3
Rhode Island	4, 918	-------	320	-------	-------	-------	------	5, 238	0. 7
South Carolina	26, 712	3, 133	3, 142	-------	-------	13	------	33, 000	4. 3
Vermont	5, 115	1, 156	110	-------	-------	-------	------	6, 381	0. 8
Virginia	25, 450	6, 448	2, 095	282	-------	19	------	34, 294	4. 4
West Virginia	18, 706	582	8, 188	-------	138, 496	530	------	166, 502	21. 5
Total 1950	441, 903	93, 440	82, 266	353	153, 783	2, 338	75	774, 158	100. 0
Total 1949	282, 246	71, 127	49, 702	128	86, 767	1, 657	126	491, 753	-------
District 2									
Illinois	94, 815	17, 368	15, 810	-------	137	10, 069	1, 691	139, 890	13. 5
Indiana	43. 727	17, 701	5, 435	-------	7, 978	1, 477	------	76, 318	7. 4
Iowa	44, 677	10, 092	5, 701	-------	-------	471	------	60, 941	5. 9
Kansas	69, 186	454	293	-------	-------	5, 267	------	75, 200	7. 3
Kentucky	26, 028	1, 633	1, 861	410	50, 587	1, 443	------	81, 962	7. 9
Michigan	42, 781	27, 294	22, 018	-------	1, 416	1, 075	------	94, 584	9. 2
Minnesota	53, 433	7, 060	3, 874	-------	-------	3, 326	------	67, 693	6. 6
Missouri	62, 468	2, 740	2, 510	-------	-------	878	4, 100	72, 696	7. 0
Nebraska	38, 995	1, 844	1, 215	-------	-------	1, 180	------	43, 234	4. 2
North Dakota	17, 808	1, 485	156	-------	-------	1, 764	1	21, 214	2. 0
Ohio	28, 457	5, 478	3, 696	-------	-------	1, 136	------	38, 767	3. 7
Oklahoma	98, 313	1, 913	2, 485	-------	336	5, 169	------	108, 216	10. 5
South Dakota	30, 576	2, 421	1, 294	-------	-------	1, 710	6	36, 007	3. 5
Tennessee	24, 229	4, 682	753	-------	196	912	------	30, 772	3. 0
Wisconsin	40, 125	10, 916	32, 550	-------	-------	1, 700	4	85, 295	8. 3
Total 1950	715, 618	113, 081	99, 651	410	60, 650	37, 577	5, 802	1, 032, 789	100. 0
Total 1949	527, 472	127, 964	85, 824	21, 817	51, 854	38, 295	2, 590	855, 816	-------
District 3									
Alabama	31, 256	2, 962	2, 111	-------	-------	455	------	36, 784	2. 8
Arkansas	71, 584	302	1, 031	-------	-------	1, 973	1, 453	76, 343	5. 9
Louisiana	128, 781	320	4, 334	40, 840	53, 552	5, 775	1	233, 603	18. 0
Mississippi	51, 277	24	462	-------	-------	3, 281	100	55, 144	4. 2
New Mexico	42, 040	4, 869	632	-------	-------	6, 081	180	53, 802	4. 1
Texas	301, 726	3, 432	16, 460	174, 379	322, 109	26, 177	538	844, 821	65. 0
Total 1950	626, 664	11, 909	25, 030	215, 219	375, 661	43, 742	2, 272	1, 300, 497	100. 0
Total 1949	570, 721	8, 285	9, 836	144, 351	370, 575	15, 372	4, 209	1, 123, 349	-------
District 4									
Colorado	31, 887	1, 121	599	-------	-------	996	200	34, 803	46. 6
Idaho	3, 526	4, 433	60	-------	-------	24	------	8, 043	10. 8
Montana	8, 179	84	400	-------	-------	219	------	8, 882	11. 9
Utah	2, 162	278	217	-------	-------	26	------	2, 683	3. 6
Wyoming	18, 741	-------	-------	-------	-------	1, 508	------	20, 249	27. 1
Total 1950	64, 495	5, 916	1, 276	-------	-------	2, 773	200	74, 660	100. 0
Total 1949	49, 602	2, 618	1, 321	-------	-------	126	------	53, 667	-------
District 5									
Arizona	19, 066	785	18	-------	-------	2, 022	------	21, 891	7. 3
California	139, 305	7, 762	5, 218	12, 503	22, 374	41, 215	211	228, 588	76. 1
Nevada	2, 144	4, 085	9	-------	-------	-------	------	6, 238	2. 1
Oregon	16, 437	9, 001	2, 067	-------	-------	12	------	27, 517	9. 1
Washington	8, 832	5, 715	1, 543	-------	-------	139	------	16, 229	5. 4
Total 1950	185, 784	27, 348	8, 855	12, 503	22, 374	43, 388	211	300, 463	100. 0
Total 1949	197, 509	29, 216	15, 514	11, 554	35, 690	22, 531	------	312, 014	-------
Grand total 1950	2, 034, 464	251, 694	217, 078	228, 485	612, 468	129, 818	8, 560	3, 482, 567	-------
Grand total 1949	1, 627, 550	239, 210	162, 197	177, 850	544, 886	77, 981	6, 925	2, 836, 599	-------

[1] Data include LR-gases.

to consumers were evidently better able to determine the quantities of this fuel used for farm equipment in rural areas, and this factor has evidently helped to swell the 1950 total.

Sales of propane for internal-combustion-engine fuel increased from 20,264,000 gallons in 1949 to 63,825,000 in 1950—a reflection of the recent effort to find a market for the oversupply of this gas in summer. Deliveries of butane-propane mixtures also showed an important gain from 42,724,000 gallons in 1949 to 51,099,000 in 1950, while for butane (for which there is a year-round demand as a component for the manufacture of gasoline and synthetic rubber) there was little change—14,894,000 gallons in 1950 compared with 14,993,000 in 1949.

The more-important quantities of LP-gas sold for motor fuel are reported from districts 2, 3, and 5. The increase in sales in district 3—43,742,000 gallons in 1950 compared with 15,372,000 in 1949—and in district 5—43,388,000 gallons in 1950 against 22,531,000 in 1949—were outstanding, while there was little change for district 2—37,577,000 gallons in 1950 and 38,295,000 in 1949.

STOCKS

Stocks of natural-gas liquids at plants, terminals, and refineries on December 31, 1950, totaled 308,900,000 gallons. This 8-percent increase over December 31, 1949, is far below the increase for the previous 2 years. Large reductions in stock during the last half of the year, especially of natural gasoline, explained the small over-all increase. Compared with December 31, 1949, stocks of natural gasoline increased 2 percent, LP-gases increased 42 percent, and other products decreased 3 percent. Even with the 42-percent increase, stocks of LP-gases are turning over at more than twice the rate of stocks of natural gasoline.

TABLE 13.—Stocks of natural gasoline and allied products in the United States, 1946–49, and 1950 by months, in thousands of gallons

Date	Natural gasoline		LP-gases		Other products		Total		
	At plants and terminals	At refineries	At plants and terminals	At refineries	At plants and terminals	At refineries	At plants and terminals	At refineries	Grand total
Dec. 31:									
1946	97,339	41,328	20,882	11,382	28,282	9,996	146,503	62,706	209,209
1947	75,338	43,008	24,723	5,502	19,961	11,886	120,022	60,396	180,418
1948	106,589	44,982	31,421	12,726	31,936	6,678	169,946	64,386	234,332
1949	122,605	49,602	33,730	15,498	49,325	16,128	205,660	81,228	286,888
1950									
Jan. 31	137,083	54,054	38,777	14,406	47,415	17,514	223,275	85,974	309,249
Feb. 28	144,693	59,220	51,982	14,700	60,850	8,652	257,525	82,572	340,097
Mar. 31	147,018	56,994	50,483	14,028	51,357	3,864	248,858	74,886	323,744
Apr. 30	138,921	68,796	53,461	12,936	53,799	6,006	246,181	87,738	333,919
May 31	116,431	96,894	58,056	14,574	48,593	8,316	223,080	119,784	342,864
June 30	123,086	93,240	59,144	13,776	46,444	6,636	228,674	113,652	342,326
July 31	135,940	92,316	64,974	20,748	45,620	7,056	246,534	120,120	366,654
Aug. 31	148,153	88,410	54,021	22,344	46,593	4,494	248,767	115,248	364,015
Sept. 30	137,515	87,402	60,499	18,900	49,984	6,090	247,998	112,392	360,390
Oct. 31	128,613	72,366	62,565	19,110	53,807	9,030	244,985	100,506	345,491
Nov. 30	113,027	70,728	56,778	17,850	53,672	8,652	223,477	97,230	320,707
Dec. 31	103,341	72,492	51,630	18,144	58,673	4,620	213,644	95,256	308,900

PRICES

The price of grade 26–70 natural gasoline f. o. b. group 3 (Oklahoma) declined seasonally from 5.88 cents per gallon to 4.00 cents during the first quarter of 1950 and then rose steadily during the remainder of the year to 6.88 cents per gallon at the end of the year. Compared with 1949, the first-quarter decline was not as severe, and there was greater recovery in the last three quarters of 1950. The average price for 1950 was 5.56 cents per gallon, 0.33 cent below the 1949 average.

The average price of Regular-grade gasoline f. o. b. group 3 in 1950 was 10.12 cents per gallon, almost unchanged from 1949. The seasonal price variation of about 0.8 cent was somewhat greater than in 1949.

The only LP-gas for which Platt's Oil Price Handbook continues to carry monthly prices is commercial propane f. o. b. refineries at New York Harbor. The average price there in 1950 was 6.34 cents per gallon compared with 6.49 cents in 1949. After dropping sharply on April 1, 1949, the price remained in the neighborhood of 6 cents per gallon until September 6, 1950. At that time it started to rise and was at 8 cents by the end of the year.

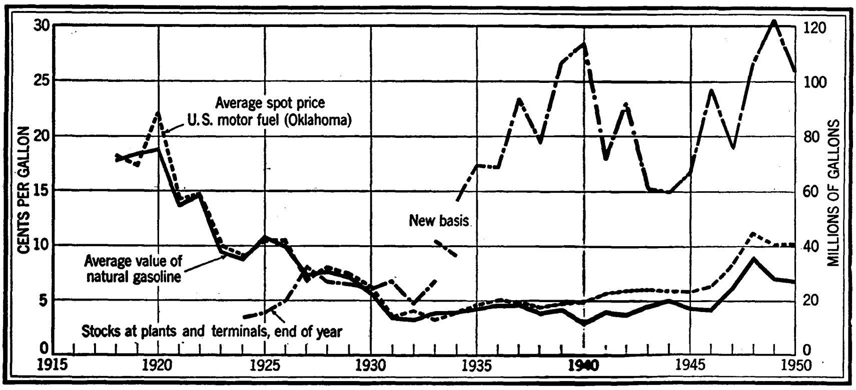

FIGURE 2.—Trends in average value of natural gasoline, spot price of gasoline, and stocks of natural gasoline, 1918–50.

TECHNOLOGY

An innovation in natural-gasoline plants placed on the market in 1950 was a small plant capable of handling 500,000 to 4,000,000 cubic feet of gas daily. The units are easily transported, operation is almost entirely automatic, and the plants are intended for use at one or more isolated wells.

The seasonal demand pattern for LP-gases, especially propane, and the high cost of high-pressure above-ground storage have stimulated experimentation in the use of underground reservoirs for storage. Storage has been attempted in oil and gas reservoirs, in which case reprocessing is necessary on removal. In the Carthage field of Texas, propane has been injected into a reservoir that contained only salt water. When withdrawn, the propane needed only drying before sale. Reservoirs have also been made in underground salt strata by circulating water to dissolve the salt.

FOREIGN TRADE [5]

The exports of natural gasoline in 1950 declined to 41,940 thousand gallons from 183,267 thousand in 1949. Canada, taking 35,513 thousand gallons, was the only remaining sizable customer. The total value of natural gasoline exported in 1950 was $3,581,214 or 8.5 cents per gallon compared with 9.5 cents in 1949.

Exports of LP-gases in 1950 totaled 67,763 thousand gallons valued at $5,747,671, an increase of 27 percent in the volume exported compared with 1949, while the average value declined from 10.8 cents per gallon in 1949 to 8.5 cents in 1950. Canada and Mexico remained the largest export customers, and both took greater quantities in 1950 than in 1949.

TABLE 14.—Natural gasoline exported from the United States 1946–50, by countries, in thousands of gallons

[U. S. Department of Commerce]

	1946	1947	1948	1949	1950
Australia		3,472	11,240	17,156	
British Malaya					
Canada	53,661	67,201	56,954	59,290	35,513
Netherlands Antilles		21,493	24,836	37,029	3,870
Trinidad				13,613	
United Kingdom	67,333	102,957	76,239	44,725	2,547
France	4,029	5,250			
Sweden	1,183	1,055	1,377		
Other countries	2,578	1,499	128	11,454	10
Total	128,784	202,927	170,774	183,267	41,940

TABLE 15.—LP-gases exported from the United States 1946–50, by countries, in thousands of gallons [1]

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
Argentina	40	8	290	546	54
Bermuda	147	198	269	282	322
Brazil	289	1,570	1,720	3,405	4,686
Canada	30,379	31,591	26,681	31,195	34,032
Cuba		59	259	463	1,264
France	1,941	2,082	(2)	(2)	639
Mexico	15,955	16,471	15,497	16,120	25,415
Philippines, Republic of	101	402	568	894	751
Other countries	239	852	236	478	600
Total	49,091	53,233	45,520	53,383	67,763

[1] Converted from pounds to gallons at 4.5 pounds per gallon.
[2] Less than 500 gallons.

[5] *Figures on exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.*

Nickel

By Hubert W. Davis

GENERAL SUMMARY

A SUBSTANTIAL upward surge in nickel requirements, which were well above production, resulted in an acute shortage in 1950. Before midyear it became apparent that the demand for nickel would exceed the available supply. Accordingly, both the International Nickel Co. of Canada, Ltd., and Falconbridge Nickel Mines, Ltd., established voluntary rationing programs for equitable distribution of the metal. Because of the shortage, some steel companies reverted to the National Emergency steels of World War II, some automobile companies reduced the thickness of plating, and foundries produced leaner nickel alloys. Total consumption of nickel in the United States established a peacetime record in 1950 and was 45 percent greater than in 1949. Deliveries to the National Stockpile were smaller. Stocks of nickel held by consumers in the United States declined 34 percent to 11,813,000 pounds on December 31, 1950, and were equivalent to slightly more than 3 weeks' requirements at the 1950 rate of consumption. Chiefly because of the transition in progress from open-pit operations to underground mining by the International Nickel Co. of Canada, Ltd., output in Canada in 1950 was 4 percent smaller than in 1949. Imports of nickel from Canada were about the same in both 1950 and 1949, but receipts from Norway declined moderately. France supplied 540,127 pounds of refined nickel in 1950. Production of nickel ore in New Caledonia gained 68 percent over 1949, but the combined output of matte and ferronickel was only 17 percent greater. Domestic output was, as heretofore, small in 1950. To aid in alleviating the shortage of nickel, the Government-owned idle nickel facilities in Oriente Province, Cuba, were scheduled to be rehabilitated.

TABLE 1.—Salient statistics for nickel, 1946–50

	1946	1947	1948	1949	1950
United States:					
Production:					
Primary……short tons..	352	646	883	790	913
Secondary……do….	8,248	9,541	8,850	5,680	8,795
Imports (gross weight) [1]……do….	104,734	88,408	106,939	97,144	97,267
Exports (gross weight) [2]……do….	7,977	12,037	8,184	[3] 4,471	3,645
Consumption……do….	80,105	80,757	93,558	68,326	98,904
Price per pound [4]……cents..	31½–35	35	33¾–40	40	40–50½
Canada:					
Production……short tons..	96,062	118,627	131,740	[3] 128,690	123,057
Exports……do….	111,422	117,056	131,840	127,141	121,651
World production……do….	136,000	154,000	166,000	161,000	160,000

[1] Excludes "All other manufactures of nickel", weight of which not recorded.
[2] Excludes "Manufactures," weight of which not recorded.
[3] Revised figure.
[4] Price quoted to United States buyers by International Nickel Co., Inc., for electrolytic nickel in carlots f. o. b. Port Colborne, Ontario; price includes duty of 2½ cents a pound, 1946–47, and 1¼ cents, 1948–50.

The steel industry continued to be the chief consumer of nickel in the United States. Seventy-six percent more nickel was used in stainless steels in 1950 than in 1949, but use for other steels was only 32 percent larger. Consumption of nickel in high-temperature and electrical-resistance alloys was up 41 percent, and that for anodes gained 26 percent. The use of nickel in cast iron increased 44 percent. Most of the nickel consumed in 1950 was in the form of metal, but the proportion of oxide and oxide sinter used was slightly more in 1950 than in 1949.

Effective June 1, 1950, the contract price to United States buyers for electrolytic nickel in carlots f. o. b. Port Colborne, Ontario, was advanced to 48 cents a pound, including duty of 1¼ cents a pound; and for nickel oxide sinter (on which there is no duty) it was increased to 44¼ cents a pound (nickel content) f. o. b. Copper Cliff, Ontario. The former prices (40 and 36¼ cents, respectively) had been in effect since July 22, 1948. On December 13, 1950, the prices were raised to 50½ and 46¾ cents, respectively.

A paper by Caron gave brief statements on investigations of various fundamental and practical factors of the ammonia leaching process for nickel and cobalt ores and also many hitherto unpublished data on various phases of the method, including conditions for ore reduction, leaching, and distillation.[1] Caron also contributed a paper on the separation of nickel and cobalt.[2]

A patent was issued for a method of recovering nickel values from ore too low in grade to be treated economically by present known processes.[3]

PRODUCTION

Domestic production of nickel (other than from imported matte and oxide) is small and comprises metals recovered from scrap—nickel anodes and nickel-silver and copper-nickel alloys (including Monel metal)—and primary nickel recovered in copper refining. There has been no output of nickel from ore or as a byproduct of talc production since 1945.

A total of 1,825,000 pounds of nickel, in the form of both crude and refined nickel sulfate, was recovered as a byproduct of copper refining at Baltimore, Md.; Carteret and Perth Amboy, N. J.; Laurel Hill, N. Y.; and Tacoma, Wash. Shipments were 1,823,000 pounds, the bulk of which was crude nickel sulfate sold to refiners for use as an intermediate in the manufacture of refined nickel salts. Although all the nickel recovered as a byproduct of copper refining is credited to domestic production, some is actually recovered from imported blister copper.

---

[1] Caron, M. H., Fundamental and Practical Factors in Ammonia Leaching of Nickel and Cobalt Ores: Trans. Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 188, January 1950, pp. 67–90.

[2] Caron, M. H., Separation of Nickel and Cobalt: Trans. Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 188, January 1950, pp. 91–104.

[3] Poole, H. G., and Ravitz, S. F. (assigned to the United States of America), Nickel Recovery: United States Patent 2,520,958, Sept. 5, 1950.

In addition to the nickel recovered as a byproduct of copper refining in 1950, 3,852,000 pounds (nickel content) of refined salts (chiefly sulfate) were produced in the United States from Canadian nickel residues, from domestic crude nickel sulfate, and from nickel shot and nickel scrap.

The total production of refined nickel salts in the United States was 4,517,000 pounds (nickel content) in 1950; shipments to consumers for electroplating, catalysts, and ceramics totaled 4,646,000 pounds.

TABLE 2.—Nickel produced in the United States, 1946–50

Year	Primary (short tons)[1], (byproduct of copper refining)	Secondary	
		Short tons	Value
1946	352	8,248	$5,801,600
1947	646	9,541	7,188,189
1948	883	8,850	6,966,720
1949	790	5,680	4,877,984
1950	913	8,795	8,408,020

[1] Bureau of Mines not at liberty to publish value.

CONSUMPTION AND CONSUMERS' STOCKS

Tables 3 and 4 give data on consumption and consumers' stocks of nickel. The data cover all known consumers of nickel in the form of metal, oxide, and matte. The figures for nickel salts, however, fall short of the total and probably represent only 70 and 51 percent, respectively, of the totals in 1950 and 1949.

TABLE 3.—Nickel (exclusive of scrap) consumed and in stock in the United States, 1949–50, by forms, in pounds of nickel

Form	1949			1950		
	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31
Metal[1]	99,377,479	12,473,528	245,459	148,508,734	9,425,850	429,732
Oxide and oxide sinter	19,514,759	2,184,431	216,131	28,840,556	575,309	54,761
Matte	15,654,621	2,908,419		17,843,880	1,295,198	
Salts	2,105,369	301,822	10,541	2,614,529	516,809	3,723
Total	136,652,228	17,868,200	472,131	197,807,699	11,813,166	488,216

[1] Includes secondary nickel (ingot or shot remelted from scrap nickel and scrap-nickel alloys).

TABLE 4.—Nickel (exclusive of scrap) consumed in the United States, 1946–50, by uses, in pounds of nickel

Use	1946	1947	1948	1949	1950
Ferrous:					
Stainless steels	35,986,164	30,700,270	32,487,815	23,817,187	41,822,486
Other steels	31,193,998	34,758,963	43,564,600	26,948,418	35,554,167
Cast iron	5,973,919	7,905,576	8,431,667	6,792,472	9,761,622
Nonferrous [1]	51,819,728	54,747,667	56,067,736	37,942,549	56,277,952
High-temperature and electrical-resistance alloys	13,596,601	10,249,545	12,336,123	8,107,918	11,407,174
Electroplating:					
Anodes	17,059,306	17,975,335	28,425,717	27,620,766	34,847,601
Solutions [2]	566,916	1,218,268	1,327,396	1,448,584	1,481,215
Catalysts [2]	544,093	878,664	1,190,851	994,206	2,015,234
Ceramics [2]	387,655	385,112	370,708	299,246	604,766
Other	3,082,394	2,694,459	2,913,905	2,680,882	4,035,482
Total	160,210,774	161,513,859	187,116,518	136,652,228	197,807,699

[1] Comprises copper-nickel alloys, nickel-silver, brass, bronze, beryllium alloys, magnesium and aluminum alloys, Monel, Inconel, and malleable nickel.
[2] The figures for solutions and ceramics for 1946–50 and for catalysts for 1946–49 fall short of the totals.

FOREIGN TRADE [4]

The quantity of nickel imported into the United States in 1950 was virtually the same as in 1949. Imports comprised chiefly metal, matte, and oxide. As heretofore, Canada was the chief source of the imports. At the plant of the International Nickel Co., Inc., at Huntington, W. Va., the roasted and sintered matte was refined to Monel metal and other products, and some sintered oxide was refined to nickel pig.

TABLE 5.—Nickel products imported for consumption in the United States in 1950, by countries, gross weight in pounds

[U. S. Department of Commerce]

Country	Metal [1]	Matte	Oxide and oxide sinter	Nickel bars, rods, etc.	Nickel scrap	Nickel-silver	Nickel residues [2]
Belgium-Luxembourg	2,494			11,076	13,225		
Canada [3]	130,426,076	22,261,814	32,612,122	36,659	337,965	15,485	356,561
Denmark	49,890				33,600		
France	540,127			4,415	50,228		
Japan	5,937						
Netherlands				7,160	6,013		
Norway	7,216,093				82,622		
Sweden						23,331	
Switzerland						23,148	
United Kingdom	23,568	9,072		14,597	727,010		
Total	138,264,185	22,270,886	32,612,122	73,907	1,250,663	61,964	356,561

[1] Adjusted by Bureau of Mines to exclude scrap.
[2] Reported to Bureau of Mines by importers.
[3] According to reports by importers to the Bureau of Mines, the roasted and sintered matte averages about 69 percent nickel, the oxide and oxide sinter about 75 percent nickel, and the nickel residues about 28 percent nickel.

The nickel content of the unmanufactured nickel products imported into the United States is estimated at 183,106,000 pounds in 1950 compared with 182,942,000 pounds in 1949.

Since January 1, 1948, the rate of duty on refined nickel imported

[4] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

into the United States has been 1¼ cents a pound. Nickel ore, matte, and oxide entered the United States duty free.

Exports of nickel comprise largely products manufactured from imported raw materials. Exports of alloy and scrap in 1950 were 2 percent more than in 1949, but those of metal, nickel-silver, and nickel-chrome electric resistance wire were smaller by 58, 52, and 38 percent, respectively.

The United Kingdom (2,887,721 pounds), Canada (2,466,108 pounds), France (209,019 pounds), India (160,910 pounds), and Italy (147,260 pounds) were the chief markets for nickel, Monel metal, alloys, and scrap.

TABLE 6.—Nickel products (excluding residues) imported for consumption in the United States, 1948–50, by classes

[U. S. Department of Commerce]

Class	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Unmanufactured:						
Nickel ore and matte	27,708,041	$3,576,268	22,256,644	$4,598,335	22,270,886	$7,610,011
Nickel pigs, ingots, shot, cathodes, etc.[1]	140,564,020	47,075,103	144,680,899	54,427,004	138,264,185	58,485,738
Nickel scrap	2,539,698	348,481	2,857,478	389,118	1,250,663	274,981
Nickel bars, rods, tubes, etc.	31,012	30,290	[2] 8,862	[2] 17,069	73,907	59,395
Nickel oxide	43,028,224	10,000,860	24,483,602	6,584,951	32,612,122	10,487,571
Manufactured:						
Nickel-silver or German silver in sheets, strips, rods, and wire	7,754	3,467			61,964	7,271
All other manufactures of nickel	(3)	5,082	(3)	5,489	(3)	4,648
Total		61,039,551		[2] 66,021,966		76,929,615

[1] Adjusted by Bureau of Mines to exclude scrap.
[2] Revised figure.
[3] Quantity not recorded.

TABLE 7.—Nickel products exported from the United States, 1948–50, by classes

[U. S. Department of Commerce]

Class	1948		1949		1950	
	Pounds	Value	Pounds	Value	Pounds	Value
Ore, concentrates, and matte	1,500	$1,725	[1] 52,000	[1] $3,906	12,826	$2,110
Alloys and scrap containing nickel (including Monel metal)	11,652,796	4,718,518	5,568,949	2,881,834	5,675,191	2,805,872
Metal in ingots, bars, sheets, etc.	2,705,777	1,494,350	1,610,329	959,725	676,169	413,541
Manufactures	(2)	745,916	(2)	922,352	(2)	876,872
Nickel-chrome electric resistance wire	747,082	1,197,348	686,270	979,813	428,885	606,189
Nickel-silver or German silver, crude, scrap, or bars, rods, etc.	1,260,330	591,858	1,024,613	442,775	496,598	236,193
Total		8,749,715		[1] 6,190,405		4,940,777

[1] Revised figure.
[2] Quantity not recorded.

WORLD REVIEW

Table 8 shows world production of nickel by countries, 1943–50, insofar as statistics are available. Despite the fact that nickel is produced in many countries, one country—Canada—has supplied about 77 percent of the world output since 1943.

TABLE 8.—World mine production of nickel, by countries, 1943–50, in metric tons of contained metal

[Compiled by Berenice B. Mitchell]

Country	1943	1944	1945	1946	1947	1948	1949	1950
Brazil	---	6	60	---	---	---	7	(1)
Canada	130,642	124,555	111,189	87,146	107,616	119,512	116,745	111,635
Cuba (content of oxide)	2,430	4,679	10,900	11,241	2,014	---	---	---
Finland	8,970	313	900	622	540	---	---	---
French Morocco	45	47	---	---	---	---	---	---
Germany	951	(1)	(1)	---	---	---	---	---
Greece	495	---	---	---	---	---	---	---
Indonesia	[2] 1,200	(1)	(1)	---	---	---	---	---
Italy [3]	43	14	12	---	---	---	---	---
Japan [3]	1,613	1,720	650	(4)	---	---	---	---
New Caledonia	7,374	8,115	4,328	2,779	3,345	4,882	3,371	6,300
Norway	577	529	516	55	---	---	---	---
Sweden	702	698	390	---	---	---	---	---
Union of South Africa	343	481	499	497	529	458	567	843
U. S. S. R.[2]	11,160	13,000	13,400	20,000	25,000	25,000	25,000	25,000
United States [5]	582	896	1,048	319	586	801	717	828
Total (estimate)	167,000	157,000	145,000	123,000	140,000	151,000	146,000	145,000

[1] Data not available; estimate by author of chapter included in total.
[2] Estimate.
[3] Preliminary data for year ended Mar. 31 of year following that stated.
[4] Less than 1 ton.
[5] Byproduct in electrolytic refining of copper. In 1944 and 1945 includes also production from ore.

Canada.—Virtually all the Canadian output is derived from copper-nickel ores of the Sudbury district, Ontario. Some nickel is also recovered as a byproduct from silver-cobalt ores of Cobalt, Ontario. Two companies—International Nickel Co. of Canada, Ltd., and Falconbridge Nickel Mines, Ltd.—are the principal producers. Nickel production in Canada was 123,057 short tons in 1950 compared with 128,690 tons in 1949. Exports of nickel from Canada were 121,651 short tons in 1950 compared with 127,141 tons in 1949.

Sales of nickel in all forms by the International Nickel Co. of Canada, Ltd., were 256,410,543 pounds in 1950 compared with 209,292,257 pounds in 1949.[5] As a consequence of the heavy demands from civilian users and for national defense, more nickel in all forms was supplied the "free world" than in any previous peacetime year.

During 1950 underground mining was expanded to compensate for the progressive exhaustion of ore that can be mined by open-pit surface methods. Underground ore mined was 5,733,269 short tons in 1950 compared with 5,015,318 tons in 1949 and 5,128,964 tons in 1948. Open-pit ore mined was 4,115,755 short tons in 1950 compared with 4,969,573 tons in 1949 and 5,737,898 tons in 1948. Accordingly, total ore mined was 9,849,024 tons in 1950 compared with 9,984,891 tons in 1949 and 10,866,862 tons in 1948. According to the company, proved ore reserves at the end of 1950 were 252,860,000 short tons containing 7,669,000 tons of nickel-copper compared with 251,805,000

[5] International Nickel Co. of Canada, Ltd., Annual Report: 1950, 28 pp.

tons containing 7,630,000 tons of nickel-copper at the end of 1949. Underground development in the operating mines advanced 87,963 feet (16⅔ miles) in 1950, bringing the total footage to 1,496,277 or over 283 miles.

Concerning developments in 1950, the company reported as follows:

Progress was made during the year on our major program of replacing open pit tonnage by obtaining and treating annually, beginning in 1953, more than twice as much ore as ever before from our underground mines.

The Murray Mine which has been under long and active development was brought to a regular production basis. At the year-end it was producing approximately 4,500 tons daily compared with 500 tons at the beginning of the period.

The main shafts at our Garson, Murray, and Levack Mines are being deepened a combined total of 3,700 feet. Simultaneously, we are in the course of sinking three entirely new shafts at Creighton Mine, Levack Mine, and the Stobie section of the Frood-Stobie Mine. The combined depth of these three new shafts will total 5,000 feet. We have also completed major alterations in the Frood section which permit the abandonment of an old shaft and make possible the recovery of several million tons of ore by low-cost surface mining.

Along with the new shaft sinkings and the deepenings, representing together nearly one and two-thirds miles of additional depth, the hoisting capacity of the Frood shaft at the Frood-Stobie Mine is being enlarged. Also, a new hoist building including a new cage hoist and other facilities at Garson Mine has been put into service. The speed of the ore hoist at Garson has been increased to provide capacity for regular operations at lower levels.

Large scale mine development for future mining is proceeding simultaneously at five distinct locations: at Garson Mine in the area of the existing main shaft; at the Stobie section of the Frood-Stobie Mine where a main ore-pass system, including large crushers at three horizons, along with ore pockets, is being installed to serve the area from the 400 foot to the 1,400 foot level; at the Frood section where the levels immediately below the bottom of the open pit are being prepared for underground mining by low-cost, blasthole methods; at the deep levels of the Creighton Mine; and at the lower-grade areas of the Creighton Mine.

In the lower areas of the Frood, water-borne sand filling operations continued, permitting more economical mining and higher production from individual working places. In order to exploit these favorable results more fully, the capacity of the tailings sand plant at Copper Cliff has been increased by fifty per cent and the use of sand for regular mine filling will be expanded to include all square-set operations.

A large portion of our open pit to underground mine transition program is the preparation at Creighton Mine for mining the lower-grade ores which have now become economical through the development of low-cost block-caving methods of mining. The sinking of the new shaft for hoisting these ores directly to the new crushing plant and concentrator was carried to a depth of 1,130 feet, where it met a raise which we had been driving upwards 700 feet from our 30 level. The shaft and the ore bins excavated below the 30 level are now being concreted.

Construction proceeded throughout the year on the permanent Creighton hoist house on the surface, the mill buildings and the pipelines for transporting the bulk concentrate seven and one-half miles to Copper Cliff. The original planned capacity of the concentrator was enlarged substantially during the year. The first unit consisting of two mills already has come into preliminary operation. A total of four units will be completed by the year-end, which will provide a rated capacity of upwards of 10,000 tons daily.

Development was continued on the main ore-pass system servicing the block caving area at Creighton. Extension of the air intake system to provide air to the lower reaches of the mine, free from contaminating effects of the caving operations, was virtually completed and construction started on a ventilation system for the initial Creighton caving blocks. Development was continued also in the area of our deep, internal Creighton shaft where the new ore handling system was completed and put into service. A rock pocket was constructed more than one mile underground to handle the material from an extensive and deep exploration program.

The higher-grade ores at Creighton will continue to be mined and will be hoisted in the existing main shaft which reaches from the surface to a depth of 4,074 feet and the internal shaft which extends to the 5,562 foot level Extensive alterations are proceeding so that any lower-grade ores obtained through the existing shafts may be conveyed to the Creighton crushing plant and concentrator for treatment along with the lower-grade output from the new shaft.

In intensifying its effort to provide expanded supplies of nickel, the company brought into production in May 1950 an additional blast furnace at the Coniston smelter, followed by an additional reverberatory furnace at the Copper Cliff smelter.

Falconbridge Nickel Mines, Ltd., operated its two blast furnaces throughout 1950, except for necessary short shutdowns. Production lost during the scheduled repair shutdown was not completely regained during the remainder of year; consequently, the total tonnage of ore hoisted and treated, as well as matte produced, was somewhat lower in 1950 than in 1949. Ore treated was 928,650 short tons in 1950 (941,929 tons in 1949). At the Falconbridge mine, where 881,838 tons of ore were hoisted in 1950, the internal shaft sunk for deeper development was stopped at 4,147 feet and completed with stations, spillage pocket, and equipment. Development and exploration therefrom was confined to the 2,975-, 3,150-, and 4,025-foot levels. At the McKim mine, which produced 46,997 tons of ore in 1950, the quantity of ore being developed exceeded that originally indicated by diamond drilling. Beginning in 1951 it will be a moderate but regular supplier of ore to the Falconbridge smelter. The ore body has been opened on six levels, and stope preparation was under way on four of these levels.[6]

In the latter months of 1950 Falconbridge Nickel Mines, Ltd., started a further expansion program designed to increase maximum production to a rate of 40 million pounds of nickel annually. It will require a minimum of 3 years to raise ore production to this rate. Some additional increases in mill and smelter capacity, over those now under way, will be required. In accordance with this program, development was begun at one of the ore bodies in the Levack area, a surface plant was under construction, and shaft sinking had been started. The property, which has been named the Hardy mine, will have a daily productive capacity of 1,000 tons of ore. Work was also commenced on the sinking of a small shaft to open an ore body for mining on the norite contact east of the Falconbridge mine.

According to Falconbridge Nickel Mines, Ltd., ore reserves totaled 15,147,500 short tons on December 31, 1950, and comprised 9,369,000 tons of developed ore averaging 1.60 percent nickel and 0.86 percent copper in the Falconbridge and McKim mines and 5,778,500 tons of indicated ore averaging 1.86 percent nickel and 1.03 percent copper in Sudbury district holdings.

The Sherritt Gordon Mines, Ltd., continued its program of exploration and development of nickel-copper ores in the Lynn Lake area of northern Manitoba in 1950. Substantial additions were made to the ore reserves; at the end of 1950 they were calculated at 14,055,000 short tons averaging 1.223 percent nickel and 0.618 percent copper. As this ore reserve was considered to be adequate for the time being, all exploratory development work was suspended, thus bringing the preliminary development stage of operation to an end. The next stage, which has now been reached, is preparation for production. After thorough study, the company decided to proceed with develop-

[6] Falconbridge Nickel Mines, Ltd., 22d Annual Report: 1950, 20 pp.

ment of a completely integrated operation to produce annually about 17,000,000 pounds of refined nickel. An annual output of 9,000,000 pounds of copper, 300,000 pounds of cobalt, and 70,000 tons of ammonium sulfate fertilizer was also anticipated. To attain it, in the initial operation, 2,000 tons of ore daily from the two highest-grade ore bodies will be treated. The "A" and "EL" ore bodies will be prepared for mining to supply the ore for the initial 2,000-ton-per-day operation. The nickel concentrate produced at Lynn Lake will be shipped to Alberta, where the company proposes to build a refinery, which will use its ammonia leaching process. Completion of the refinery was planned for the third quarter of 1953. The Canadian National Railways began a survey of a railway line to Lynn Lake.[7]

The pilot mill at Lynn Lake resumed operation in June 1950 on ore from "A", "B", and "C" ore bodies. In all, 2,687 tons of feed were put through the mill, and 160 tons of nickel concentrate and 40 tons of copper concentrate resulted. About 75 tons of nickel concentrate were shipped to Ottawa for refining in the company pilot leaching plant. Operation of the pilot leaching plant resulted in many improvements being made in the ammonia leach process, and information was acquired for the design of a permanent treatment plant. A limited amount of laboratory work was done on outside concentrates to determine their amenability to treatment by leaching processes. During November the plant and equipment were moved to a new location in Ottawa and when completed will be fully equipped to carry out pilot-plant operations using the company ammonia leach process, the Chemical Construction Co. acid leach process, or any combination of the two.

Cuba.—Agreements for the rehabilitation and operation of the United States Government-owned Nicaro nickel plant were announced by the Administrator of General Services on January 16, 1951. The Frederick A. Snare Corp., the construction contractors that built the extensive mining and metallurgical facilities in 1942, will put them in shape for new operations. Mining Equipment Corp., a wholly owned American subsidiary of N. V. Billiton Maatschappij of The Hague, Netherlands, will operate the plant and act as engineering consultants for the rehabilitation project. The facilities are expected to be producing nickel oxide at a rate of 32,000,000 pounds (nickel content) annually within 10 to 12 months. The output will be taken by the Government for stockpiling and other purposes. The Nicaro property occupies 1,133 acres on Lengua de Pajaro Peninsula, Lavista Bay, Oriente Province. It consists of rail and port terminals, mining facilities, and a metallurgical plant of some 30 industrial structures.

Netherlands.—According to the Mining World:[8]

> Mining activity in the Celebes has been confined to further exploratory work in the nickel areas. However, a report indicates that some deposits of fairly good ore have been discovered recently which could be worked by the installation of a special plant to treat garnieritic nickel ore. Exploration also has located several deposits of magnesite which will be worked if they are found to be sufficiently large. Recently East-Borneo Company started exploration in the southern sections of the island.

[7] Sherritt Gordon Mines, Ltd., Annual Report: 1950, 16 pp
[8] Mining World, vol. 12, No. 7, June 1950, p. 57.

It was reported that, because of the uncertain situation politically in Celebes, the Billiton Co. had abandoned its work in its nickel concessions and withdrawn the staff and laborers.[9]

New Caledonia.—The Thio Group at Thio, on the east coast, belonging to La Société le Nickel, was the only nickel property in production in 1950. Output of ore was 157,645 metric tons containing 3.20 to 5.26 percent nickel.

Production of matte in 1950 was 5,790 metric tons averaging 77 percent nickel (3,950 tons in 1949).

Production of ferronickel was 1,119 metric tons, averaging about 37.5 percent nickel (1,936 tons in 1949).

On May 20, 1950, the Economic Cooperation Administration announced conclusion of an agreement with the French Government whereby $965,000 worth of American mining equipment would be provided for modernization and development of nickel production in New Caledonia by La Société le Nickel. The expansion program is expected to increase the production of nickel to 10,000 to 12,000 tons annually.

Norway.—Operating conditions in 1950 at the Falconbridge nickel refinery at Kristiansand were influenced unfavorably by both a shortage of labor, particularly during the summer months, and by construction and alteration work related to the modernization program. Nevertheless, refinery production in 1950 somewhat exceeded the 1949 output of both refined nickel and copper. The new smelting and roasting unit was satisfactorily placed in operation, reducing the strain on some of the old equipment and also resulting in metallurgical improvements. During the last quarter of 1950 production was at a materially higher level than ever before achieved.[10]

Union of South Africa.—A small quantity (843 metric tons in 1950) of nickel in the form of matte is produced annually in the Rustenburg district, Union of South Africa, by Rustenburg Platinum Mines, Ltd. The matte is exported to England for refining.

According to the Mining World, Nickel Corp. of Africa, Ltd., has been organized to exploit the Insizwa nickel deposit in East Griqualand, Cape Province. The ore, chiefly copper-nickel sulfides, occurs in a differentiated zone 10 to 12 feet thick at the contact between basinlike intrusive masses resting on Karroo sediments in mountainous country.[11]

At the annual general meeting of shareholders in Nickel Corp. of Africa, Ltd., it was reported that some very high-grade ore had been exposed in Brook's Adit as well as in a development rise which is being made between Morley's and Honnold's Adit. The company was erecting a plant for crushing high-grade material recovered from development and proposes to export the ore to different refineries in Europe.[12]

United Kingdom.—Nickel production by the Mond Nickel Co. at the refinery at Clydach, Wales, was 48,000,000 pounds in 1950 compared with 49,400,000 pounds in 1949.

[9] Mining World, vol. 12, No. 8, July 1950, p. 49.
[10] Falconbridge Nickel Mines, Ltd., 22d Annual Report: 1950, p. 8.
[11] Mining World, vol. 12, No. 5, May 1950, p. 49.
[12] South African Mining and Engineering Journal, vol. 61, part 2, No. 3005, Sept. 16, 1950, pp. 77, 79.

Nitrogen Compounds

By Bertrand L. Johnson

GENERAL SUMMARY

BY THE beginning of 1950, the supply of nitrogen in the United States—the largest producer and consumer of nitrogen in the world—had come into balance with the requirements of that commodity. Total domestic productive capacity even exceeded somewhat the normal peacetime demand, for agricultural, industrial, and military needs.

The rising trend of agricultural and industrial demand, stepped-up military demand, and the need to be prepared against the eventuality of full-scale war, pointed to the need at the end of 1950, for additional nitrogen production capacity in the near future.

In 1950 there were no Government controls over the distribution of nitrogenous fertilizers by private producers for use in domestic agriculture. Such controls as had existed in the export field were eliminated in May 1950, when the Office of International Trade announced deletion from the positive list of nitrogenous fertilizer materials (except those containing ammonium nitrate) and prepared fertilizer mixtures. Thereafter, with the exceptions noted, those commodities could be exported in any quantity to any destination without export license.

The principal part of our domestic production of nitrogen compounds consists of ammonia solutions (including liquid anhydrous ammonia), ammonium sulfate, ammonium nitrate, and synthetic sodium nitrate. Little industrial chemical nitrogen is imported, but large quantities of nitrogenous fertilizer materials enter the United States each year. Export fertilizer nitrogen is mostly in the form of ammonium sulfate and ammonium nitrate, large quantities of which are shipped abroad. Much smaller tonnages of anhydrous ammonia and ammonium nitrate are exported as industrial chemicals.

DOMESTIC PRODUCTION

Ammonium Compounds.—Domestic production of synthetic anhydrous ammonia in 1950 attained another new high—1,565,569 short tons. The domestic areas where the major nitrogen compounds are produced are indicated in figure 1.

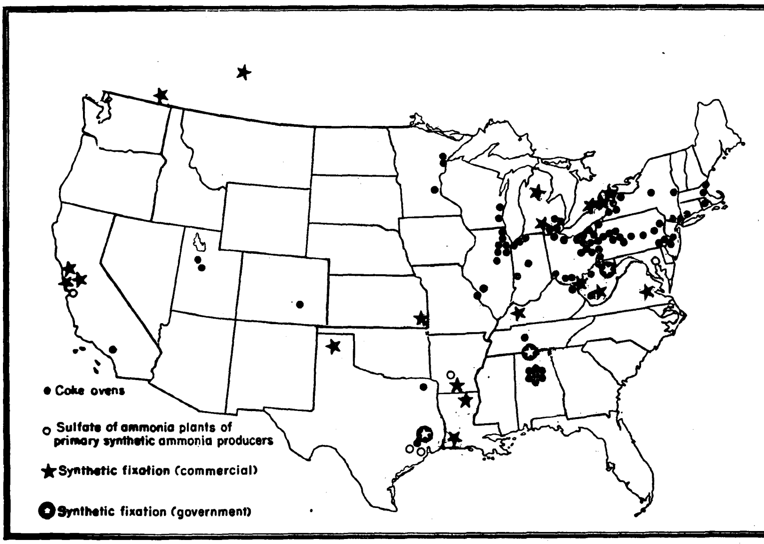

FIGURE 1.—Locations of domestic nitrogen production. (Based on diagram in National Fertilizer Association, Fertilizer Review, October–December 1950, p. 3.)

TABLE 1.—Principal nitrogen compounds produced in the United States, 1947–50, in short tons

Commodity	1947	1948	1949	1950
Ammonia (NH_3):				
Synthetic plants: Anhydrous ammonia [1]	[2] 1,114,000	1,089,786	1,294,057	1,565,569
Byproduct coking plants (NH_3 content):				
Aqua ammonia	25,718	24,753	22,750	23,387
Ammonium sulfate	202,360	207,671	189,202	207,754
Subtotal	228,078	232,424	211,952	231,141
Grand total	1,342,078	1,322,210	1,506,009	1,796,710
Principal ammonium compounds:				
Ammonium sulfate:				
Synthetic plants [1]	[2] 195,848	[2] 264,476	846,195	1,137,721
Byproduct coking plants [3]	809,440	830,683	756,807	831,016
Total	[2] 1,005,288	[2] 1,095,159	1,603,002	1,968,737
Ammonium nitrate, basis solution, 100 percent NH_4NO_3 [1]	[2] 1,086,869	988,342	1,018,706	1,213,911

[1] Data from Bureau of Census monthly Facts for Industry series.
[2] Revised figure.
[3] Does not include ammonium sulfate produced at byproduct coking plants from purchased anhydrous ammonia as follows: 1947—11,070 short tons; 1948—30,749 short tons; 1949—58,826 short tons; 1950—14,699 short tons.

On January 1, 1950, the Army had in its possession three operating anhydrous ammonia plants—the Morgantown Ordnance Works, Morgantown, W. Va.; the Ohio River Ordnance Works, West Henderson, Ky.; and the San Jacinto Ordnance Works, near Houston, Tex. These were offered for sale or lease on January 5, 1950. On May 3, 1950, the Ohio River Ordnance Works was sold by the Government to the Spencer Chemical Co. This plant ceased operations while it was being converted from coke to natural gas as a source of hydrogen but resumed the production of ammonia on November 5, 1950. The San Jacinto works was leased in August 1950 to R. F. Mueller Co., Baltimore, Md. The lease was assigned to the San Jacinto Chemical Corp—a new company—which was to operate the plant. The Morgantown Ordnance Works, the second-largest ammonia plant in America, closed in May 1950 and had not been sold or leased by the end of that year.

The total production of ammonium sulfate from both synthetic and byproduct sources increased from 1,603,002 tons in 1949 to 1,968,737 tons in 1950. Production of this commodity has nearly doubled since 1947, owing almost entirely to the rapidly expanding production of synthetic ammonium sulfate, now nearly a million tons a year greater than in 1947, and accounting for the big bulk of total production.

Ammonium nitrate production reached a new high in 1950, with a considerable increase over 1949. By far the greater part of it went into agriculture.

The Government-owned alumina-from-clay plant at Salem, Oreg., was acquired in 1950 by the Continental Chemical Co. of Salem, Oreg., which redesigned the equipment to produce battery-grade manganese dioxide with ammonium sulfate as a byproduct. This company has been reported sold to the Ray-O-Vac Battery Co. of Madison, Wis., which will continue operating the plant.

Sodium Nitrate.—The synthetic nitrate of soda consumed in the United States in 1950 was produced domestically; none was imported. Only two companies were in production—Solvay Process Division, Allied Chemical & Dye Corp., Hopewell, Va., and Mathieson Chemical Corp., Lake Charles, La.

Deposits of soluble nitrate minerals, none of present economic importance, occur in various parts of the United States. (See Minerals Yearbook 1942, p. 1522.)

CONSUMPTION AND USES

Nitrogen plays important parts in both agriculture and industry. A small amount of elemental nitrogen is used for industrial purposes, but most nitrogen enters both agriculture and industry in various chemical compounds. In agriculture, which in the fiscal year ended June 30, 1950, consumed more than a million tons of nitrogen, the principal chemical nitrogen materials, in order of importance, were ammonium nitrate, ammonium nitrate solutions, and ammonium nitrate-limestone mixtures, sodium nitrate, ammonium sulfate, anhydrous ammonia and solutions, calcium cyanamide, calcium nitrate, urea, and divers nitrogen chemicals. A considerable tonnage of nitrogen is included in natural organic materials.

According to the United States Department of Agriculture, shipments of ammonium nitrate increased from 347,223 tons in 1948–49 to 577,562 tons in 1949–50. In addition, in the latter year there were shipments of 102,205 tons of ammonium nitrate-limestone mixtures and 11,108 tons of ammonium nitrate solutions. Consumption of sodium nitrate totaled 627,424 tons and ammonium sulfate 234,664 tons. The use of anhydrous ammonia in agriculture continued to increase. In 1949–50, 85,516 tons were consumed compared with 65,596 tons in 1948–49.[1]

Industrial nitrogen sources are principally synthetic ammonia, byproduct ammonia from coking, cyanamide and cyanides, and Chilean sodium nitrate. Ammonia is one of the major basic chemicals, and the synthetic ammonia industry is by far the largest source of ammonia and its derivatives for increasingly widespread diverse uses.

PRICES

Changes in price quotations of several of the nitrogen compounds—ammonium nitrate, ammonium sulfate, and anhydrous ammonia—were reported in 1950. Eastern Canadian ammonium nitrate was advanced in price on September 15, 1950, from $57.50 a ton (the price prevailing during the earlier months of the year) to $63. On December 15, 1951, a further increase to $69.50 was announced. The quotation on western domestic ammonium nitrate was also raised late in the year from $58 a ton to $63. The established price quotations of ammonium sulfate at the beginning of 1950 were $45 to $50 a ton. In May the price of coke oven ammonium sulfate was slashed $13 a ton by the steel producers, one of the deepest cuts ever made for this type of nitrogen fertilizer; this brought the range down to $32 to $37 a ton, according to the producing point. In September 1950 several western and southern producers advanced their price $3 a ton, and in December 1950 other producers raised their prices $8 a ton, reportedly because of increased costs of sulfuric acid, freight, and labor. At the end of the year the price range was $32 to $45 a ton. The price quotations of various nitrogen compounds on January 2, 1950, and December 25, 1950, from the Oil, Paint and Drug Reporter of those dates, are shown in table 2.

TABLE 2.—Prices of major nitrogen compounds in 1950, per short ton [1]

Commodity	Jan. 2, 1950	Dec. 25, 1950
Chilean nitrate, port warehouse, bulk	$48.00	$48.00
Sodium nitrate, synthetic domestic, c. l. works, crude bulk	45.00	45.00
Ammonium sulfate, coke ovens, bulk	45.00–50.00	32.00–45.00
Cyanamide, fertilizer-mixing grade, 20.6% N, granular, Niagara Falls, Ont., bulk	46.50	46.50
Ammonium nitrate, fertilizer grade, Canadian eastern, 32.5% N, c. l. shipping point, bags	57.50	63.00
Western, domestic, works, bags	58.00	58.00–63.00
Anhydrous ammonia, fertilizer, tanks, works	74.00–75.00	74.00–80.00
Ammonium-nitrate-dolomite compound, 20.5% N, Hopewell, Va., bags	46.00	46.00

[1] Quotations from Oil, Paint and Drug Reporter of the dates listed.

FOREIGN TRADE [2]

Large amounts of natural sodium nitrate from Chile enter the United States each year, the quantity greatly exceeding the import tonnage of any other nitrogenous material. Domestic demand for

[1] Scholl, Walter, and Wallace, H. M., Commercial Fertilizers. Consumption in the United States, 1949–50: U. S. Dept. of Agriculture, Beltsville, Md., 1951, 13 pp.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Chilean sodium nitrate, as indicated by the imports, has declined since 1948 but has not yet reached the levels of 1946 and 1947. The quantity imported fell from 675,543 short tons in 1949 to 615,674 tons in 1950. The value of the imports also dropped in 1950 to $22,301,880.

Chilean sodium-potassium nitrate has been imported into the United States recently in small quantities, reaching 20,409 tons in 1950, the highest amount in recent years. The value of these imports was $882,582.

TABLE 3.—Major nitrogen compounds imported into and exported from the United States, 1947–50, in short tons [1]

[U. S. Department of Commerce]

	1947	1948	1949	1950
Imports:				
Industrial chemicals:				
Ammonium nitrate	27	80	1	
Anhydrous ammonia		209		
Fertilizer materials:				
Ammonium nitrate mixtures:				
Containing less than 20 percent nitrogen	92	250	2,290	1,523
Containing 20 percent or more nitrogen	99,322	100,314	136,405	221,299
Ammonium phosphates	105,189	108,228	126,274	106,641
Ammonium sulfate	114,398	105,887	105,498	143,532
Calcium cyanamide	153,764	116,504	115,885	97,725
Nitrogenous materials, n. s. p. f.	9,687	5,304	4,829	23,830
Potassium nitrate, crude	(2)	(2)	1	20
Sodium nitrate	556,525	709,573	675,543	615,674
Sodium-potassium nitrate	2,500		6,802	20,409
Exports:				
Industrial chemicals:				
Anhydrous ammonia	6,062	3,407	[3] 3,477	10,202
Ammonium nitrate	6,685	5,087	17,004	3,336
Fertilizer materials:				
Ammonium nitrate	(4)	(4)	470,443	94,169
Ammonium sulfate	88,601	136,648	660,733	825,615
Nitrogenous chemical materials, n. e. s.	153,607	701,450	23,510	41,363
Sodium nitrate	19,920	17,100	3,714	35,222

[1] Revisions for 1946 exports in Minerals Yearbook, 1949, p. 896, should read: Nitrogenous chemical materials, n. e. s. 117,315 short tons; sodium nitrate, 16,240 short tons.
[2] Less than 0.5 ton.
[3] Revised figure.
[4] Not separately classified, 1947–48; included in nitrogenous chemical materials, n. e. s.

TABLE 4.—Sodium nitrate and sodium-potassium nitrate imported for consumption in the United States, 1945–50 [1]

[U. S. Department of Commerce]

Year	Sodium nitrate		Sodium-potassium nitrate		Year	Sodium nitrate		Sodium-potassium nitrate	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1945	849,888	$18,558,959			1948	709,573	$23,042,302		
1946	540,870	11,681,235	4,400	$146,312	1949	675,543	26,006,053	6,802	$310,343
1947	556,525	15,153,889	2,500	64,968	1950	615,674	22,301,880	20,409	882,582

[1] All from Chile except sodium nitrate from Canada as follows: 1947: 42 tons, $2,542; 1948: 199 tons, $11,057; 1949: 8 tons, $416; 1950: Canada, 14 tons; Germany, 11 tons.

WORLD REVIEW

World-wide demand for nitrogen continues to increase. In the 1950–51 fertilizer year new records were made in both production and consumption of nitrogen, large increases occurring in both categories.

Estimates by leading authorities, however, differ as to the adequacy of the increased production to meet new demands for agricultural use. United Nations Food and Agriculture Organization estimates show an excess of production, while those of the Aikman (London), Ltd., suggest that there was an inadequate supply of nitrogen in 1950–51, world consumption exceeding production by about 150,000 metric tons. On the other hand, production and consumption of industrial nitrogen in 1950–51 were in balance, according to the Aikman company, the deficit occurring in the agricultural supply. Details are shown in tables 5 and 6.

TABLE 5.—World production and consumption of fertilizer nitrogen compounds, fiscal years 1949–51, by principal countries, in metric tons of contained nitrogen

[United Nations Food and Agriculture Organization]

Country	Production			Consumption		
	1948–49	1949–50	1950–51	1948–49	1949–50	1950–51 [1]
Austria	59,000	67,820	75,000	19,600	17,620	22,000
Belgium	152,130	174,985	171,120	72,600	78,345	85,000
Canada	175,420	143,676	143,676	31,720	31,240	31,240
Chile	275,270	241,823	252,600	8,140	7,042	7,500
Czechoslovakia	29,950	30,000	30,300	30,000	35,000	40,000
Denmark				45,400	59,588	71,593
Egypt				76,000	93,000	101,000
France [2]	187,500	214,000	238,000	224,000	225,000	255,000
Germany:						
Federal Republic	327,600	431,405	461,700	335,540	327,641	360,400
Soviet Zone	110,000	130,000	150,000	110,000	130,000	150,000
Greece				19,600	25,000	35,000
India	12,630	9,200	9,200	49,150	64,234	65,440
Italy	104,330	136,905	169,000	109,930	119,882	165,000
Japan	274,070	378,481	434,348	300,000	303,063	396,856
Korea, South				75,000	98,857	40,000
Netherlands	85,080	112,557	189,000	116,500	143,187	163,000
Norway	107,500	150,040	160,000	25,220	36,864	36,000
Peru	22,210	34,159	33,440	26,380	36,399	37,680
Poland	55,080	60,000	65,000	58,440	70,000	75,000
Portugal [2]				17,000	23,000	23,000
Spain [2]	3,370	2,500	6,600	45,540	38,500	56,600
Sweden	21,540	23,397	25,530	40,660	59,642	64,670
Taiwan (Formosa)	2,090	3,510	6,325	20,710	42,570	63,976
United Kingdom [2]	280,800	275,282	262,220	187,600	209,221	205,065
United States [2]	975,000	1,048,000	1,021,000	915,000	935,000	1,157,000
World total [3]	3,310,900	[4] 3,707,000	3,956,773	3,123,240	3,404,694	3,941,407

[1] Preliminary figures.
[2] Figures for consumption include overseas territories.
[3] Exclusive of U. S. S. R; includes amounts for minor producing and consuming countries not listed above.
[4] Revised by Bureau of Mines.

TABLE 6.—Estimates of world production and consumption of nitrogen, in thousands of metric tons [1]

Date	Estimated production—		Estimated consumption—	
	For agriculture	For industry	In agriculture	In industry
1947–48	2,825	505	2,820	505
1948–49	3,360	585	3,225	585
1949–50	3,805	655	3,515	655
1950–51	3,845	705	3,995	705

[1] Exclusive of U. S. S. R. Source: Aikman (London), Ltd., Half-Yearly Report on the Nitrogen Industry, June 14, 1951.

Peat

By J. A. Corgan and Golden V. Chiriaco

GENERAL SUMMARY

PRODUCTION of peat in the United States in 1950 increased 1 percent in tonnage and 11 percent in unit value over 1949. The output is used entirely within the United States, none being exported. Imports increased 32 percent over 1949 and accounted for half of the quarter million tons consumed in this country in 1950.

TABLE 1.—Salient statistics of the peat industry in the United States, 1946–50

	1946	1947	1948	1949	1950
SHORT TONS					
Production	140,707	136,232	129,581	129,532	130,723
Imports	84,078	79,567	91,073	94,747	124,864
Available supply	224,785	215,799	220,654	224,279	255,587
World production	42,000,000	52,000,000	49,000,000	50,000,000	57,000,000
VALUE					
Production	$1,006,231	$868,979	$929,560	$1,020,014	$1,142,566
Average per ton	7.15	6.38	7.17	7.87	8.74

RESERVES

Minnesota, Wisconsin, and Michigan combined contain 75 percent of the total reserves of peat in the United States, Florida contains 14 percent of the country's total, and the rest is distributed through the New England and Pacific Coast States. Total reserves were calculated in 1922 at 13,827,000,000 short tons in terms of air-dried peat.[1] It is estimated that about 2,000,000 tons of peat have been recovered from these reserves since 1922.

PRODUCTION

Forty-eight producers operating in 17 States accounted for the 1950 production of 130,723 tons reported to the Bureau of Mines, as compared with 48 producers operating in 19 States in 1949. Although six plants that produced peat in 1949 were inactive in 1950, a like number of plants that did not produce peat in 1949 reported production for 1950. Value of the peat produced in 1950 was $1,142,566.

TABLE 2.—Peat produced in the United States, 1946–50

Year	Short tons	Value	
		Total	Per ton
1946	140,707	$1,006,231	$7.15
1947	136,232	868,979	6.38
1948	129,581	929,560	7.17
1949	129,532	1,020,014	7.87
1950	130,723	1,142,566	8.74

[1] Soper, E. K., and Osbon, C. C., The Occurrence and Uses of Peat in the United States: U. S. Geol. Survey Bull. 728, 1922, p. 92.

More peat was produced in New Jersey in 1950 than in any other State. The output of New Jersey together with that of the next three leading States—Florida, Ohio, and Michigan—accounted for nearly two-thirds of the United States total.

Peat humus, produced in 13 States, comprised about 65 percent of the total production in 1950; reed or sedge, produced in 7 States, about 27 percent; and moss peat and other, produced in 8 States, about 8 percent.

TABLE 3.—Peat produced in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	2,034	$11,620				
California	6,942	33,265	5,670	$35,193	6,399	$37,192
Colorado	(1)	(1)	2,800	24,504	3,210	28,088
Connecticut	4,332	24,124	5,974	33,011	6,294	35,145
Florida	24,750	56,171	11,800	69,000	23,022	151,270
Georgia	2,500	50,000	1,870	56,000	1,750	41,000
Indiana	2,288	11,576	7,949	28,537	5,793	18,966
Iowa	(1)	(1)	(1)	(1)	3,000	19,500
Maine	1,100	29,699	3,312	79,360	2,912	61,600
Massachusetts	441	6,188	595	7,415	650	7,575
Michigan	12,425	154,500	(1)	(1)	12,750	174,000
Minnesota	3,000	12,900	12,820	54,255	400	13,100
New Hampshire			15	296		
New Jersey	23,102	163,056	25,500	180,750	26,466	186,338
Ohio	19,207	162,073	20,372	181,117	22,145	245,379
Pennsylvania	(1)	(1)	6,663	30,035	(1)	(1)
Texas	1,334	19,028	1,531	12,000	977	10,566
Washington	(1)	(1)	(1)	(1)		
Wisconsin	(1)	(1)	(1)	(1)	2,293	9,536
Other States	[2] 26,126	[2] 195,360	[2] 22,661	[2] 228,541	[2] 12,662	[2] 103,311
Total	129,581	929,560	129,532	1,020,014	130,723	1,142,566

[1] Reported under "Other States" to avoid disclosure of individual company operations.
[2] Includes data for Illinois and States indicated by footnote 1.

TABLE 4.—Peat produced in the United States, 1949–50, by kinds

Kind	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Per ton		Total	Per ton
Moss peat	10,150	$149,531	$14.73	9,139	$109,196	$11.95
Reed or sedge	40,945	260,939	6.37	35,791	328,365	9.17
Peat humus	78,036	608,626	7.80	85,243	704,332	8.26
Other	401	918	2.29	550	673	1.22
Total	129,532	1,020,014	7.87	130,723	1,142,566	8.74

USES

In 1950, as in preceding years, peat was used in this country primarily for soil improvement. Of the total sales of domestic peat reported for 1950, 67 percent was for soil improvement, 28 percent *for mixed fertilizers*, and 5 percent for other purposes.

United States Government Specifications.—The Federal Government purchases a certain amount of peat principally for horticultural purposes, provided the peat meets required specifications. These specifications may be obtained from the Federal Supply Service, General Services Administration, Washington 25, D. C.

TABLE 5.—Peat sold in the United States, 1946–50, by uses

Year	Soil improvement		Mixed fertilizers		Other uses		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	99,733	$664,565	32,471	$263,542	6,684	$66,286	138,888	$994,393
1947	105,796	584,012	28,354	266,359	1,561	17,593	135,711	867,964
1948	86,991	578,615	36,012	309,259	6,000	36,000	129,003	923,874
1949	76,963	546,062	40,897	385,015	11,672	89,237	129,532	1,020,314
1950	87,090	704,200	36,433	391,174	7,198	47,345	130,721	1,142,719

IMPORTS [2]

The quantity of moss peat imported into the United States in 1950 reached an all-time high of 124,864 short tons, an increase of 32 percent over the 94,747 tons imported in 1949 and 59 percent over the 1939 prewar figure of 78,611 tons. In 1950, as in past years, no exports of peat were reported.

TABLE 6.—Peat moss imported for consumption in the United States, 1948–50, by kinds and by countries

[U. S. Department of Commerce]

Country	Poultry and stable grade					
	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada	31,328	$1,130,686	25,473	$890,230	20,808	$828,966
Denmark	25	830	32	838	50	1,254
Germany	23	587	1,646	43,177	8,236	219,098
Ireland	63	2,207	[1] 434	[1] 19,680	682	21,546
Netherlands	70	2,049	474	12,622	923	17,128
Poland-Danzig			122	3,900		
Sweden	1	49	16	464	63	2,221
United Kingdom	55	1,846			34	812
Total	31,565	1,138,254	28,197	970,911	30,796	1,091,025

Country	Fertilizer grade [2]					
	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Belgium-Luxembourg			55	$710		
Canada	54,700	$1,928,087	48,162	1,651,913	46,762	$1,610,988
Denmark	488	15,856	1,145	31,909	1,051	24,550
Germany	334	7,583	5,306	136,045	31,399	779,923
Ireland	668	25,797	[1] 2,800	[1] 112,545	2,171	74,126
Netherlands	2,555	52,409	5,894	154,593	7,673	149,011
Norway			2	51		
Poland-Danzig	512	18,385	2,735	106,351	3,823	106,325
Sweden	19	733	367	17,541	432	12,482
United Kingdom	232	7,552	[1] 84	[1] 1,840	757	17,487
Total	59,508	2,056,402	66,550	2,213,498	94,068	2,774,892

[1] Revised figure.
[2] Changes (1947) for table in Minerals Yearbook, 1949, p. 859, are as follows: Netherlands, $49,957; total, $1,446,387.

[2] Figures on imports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

WORLD REVIEW

Although peat has not been used generally in this country as fuel because supplies of higher-grade fuels at competitive prices have been ample, some European countries have utilized peat for fuel and power purposes for many years. With the rising demand for other fuels in Europe in the last several years, considerable attention has been focused on the possibilities for expanding the use of peat. A report published by the British Government [3] contains the following interesting facts on peat utilization in certain countries:

In Eire, the shortage of coal, especially during the war years, has stimulated the production of peat to about 5 million tons annually. The use of peat as a domestic fuel has been investigated in tests carried out at the Fuel Research Station and by the Industrial Research Council of Eire. Special domestic appliances for the efficient and economical combustion of peat fuel have been produced.

The use of peat as a fuel for steam generation has been investigated in many countries, notably Germany, Russia, and Eire. The methods adopted included direct combustion of peat under boilers either in the form of air-dried blocks, a coarse powder (milled peat), or a dried, pulverized fuel and the complete gasification of peat in producers followed by combustion of the gas in gas-fired steam boilers.

Peat has been carbonized on a moderate scale on the Continent of Europe and in Russia, mainly for the production of peat coke, which was used in gas producers and for metallurgical purposes. Although a number of processes have been devised for the carbonization of peat, whereby valuable byproducts are claimed to be produced, no such processes have been exploited commercially with success in Great Britain.

The report further states that, apart from its use as a fuel and for horticultural and agricultural purposes, peat has been used as a packing and insulating material, in the production of building materials and textiles, in gas purification, as an absorbent in surgical dressings, in water purification for the production of alcohol, etc. These uses, however, are on a very limited scale and are not likely to be extended for economic and other reasons. By the treatment of certain types of peat with solvents, ester waxes can be extracted, which, after suitable processing, may prove satisfactory as a substitute for montan wax. Further investigations, however, would be necessary to determine whether an economically successful process could be developed. From the information available it would appear that the possibility of extraction of waxes from peat deserves careful study.

[3] Department of Scientific and Industrial Research, Fuel Research, London, The Winning, Harvesting and Utilization of Peat: His Majesty's Stationery Office, 1948, p. 24.

World Production.—The latest available data on the world production of peat are given in table 7.

TABLE 7.—World production of peat, by countries, 1944–50, in metric tons [1]

[Compiled by Pauline Roberts]

Country	1944	1945	1946	1947	1948	1949	1950
Canada:							
Fuel	584	107	132	86	77	51	62
Peat moss	72,979	76,170	87,850	72,592	81,465	72,800	62,268
Denmark	5,800,000	5,684,723	3,705,180	5,168,139	3,616,860	1,416,406	901,802
Finland: [2]							
Peat for litter	2,840	7,280	6,846	14,231	17,188	[3] 18,650	(4)
Turf for fuel	42,127	176,508	176,509	153,164	197,659	178,538	(4)
France	112,619	95,842	84,621	57,995	(4)	(4)	(4)
Germany:							
Federal Republic	(4)	[3] [5] 20,000	[3] 500,000	1,800,000	2,038,000	1,203,266	(4)
Soviet zone		(4)	(4)	(4)	(4)		
Hungary [6]	(4)	(4)	3,720	8,550	(4)	(4)	(4)
Iceland	11,973	11,000	[3] 10,500	3,200	3,400	(4)	(4)
Ireland	5,302,477	5,086,734	4,826,238	4,850,512	[3] 3,846,800	[3] 4,079,400	(4)
Italy	72,152	156,069	(4)	(4)	(4)	(4)	(4)
Netherlands	722,700	664,800	701,600	715,000	966,000	779,000	520,000
Norway	554,043	503,062	(4)	378,600	343,130	381,659	358,200
Portugal	1,490	2,322	2,456	2,715	1,529	266	402
Sweden:							
Fuel	774,612	1,049,089	770,230	436,249	363,794	(4)	(4)
Litter, baled	105,310	101,420	68,513	72,473	93,197		
Litter and "Mull," unbaled	1,303	1,075	964	3,246	503		
"Mull," baled	16,600	14,629	9,862	12,486	14,833		
Switzerland	[3] 310,000	497,429	100,000	40,000	(7)	(4)	(4)
U. S. S. R.	(4)	19,760,000	(4)	32,000,000	(4)	(4)	(4)
United States	88,000	97,000	127,647	123,587	117,553	117,509	118,589
Total (estimate)	37,000,000	34,000,000	38,000,000	47,000,000	44,000,000	45,000,000	52,000,000

[1] In addition to countries listed, Austria and Poland produce peat, but production data are not available; estimate included in total.
[2] Revised figures.
[3] Estimate.
[4] Data not available; estimate included in total.
[5] American zone only.
[6] Data represent Trianon Hungary after October 1944.
[7] Negligible.

Petroleum and Petroleum Products

By A. G. White, A. T. Coumbe, A. L. Clapp, and K. F. Hartman

GENERAL SUMMARY

OUTSTANDING features of the petroleum situation in 1950 were a much higher total demand [1] for all oils than was anticipated and the erratic seasonal supply and operation situation that resulted. Most of the abnormal accumulation of stocks of refined products in 1948 was still on hand at the beginning of 1950, and refinery operations were kept at a low level in the first half of the year, with an unusual reduction of 34.4 million barrels in refined stocks. With product stocks close to workable levels on June 30 and indications of increasing demand, crude runs set a new record in July and continued at well over 6 million barrels daily for the rest of the year. Daily average crude runs in the first half of 1950 were only 2 percent greater than in 1949 but almost 14 percent larger in the last half.

The total demand for all oils in 1950 amounted to 2,483 million barrels or a daily average of 6,803,000, an 11-percent gain compared with 1949. Total exports in 1950 were 111 million barrels or 304,000 barrels daily, a decline of 7 percent. Domestic demand in continental United States totaled 2,372 million barrels in 1950 or 6,499,000 barrels daily, a 12-percent increase compared with 1949.

Continuation of the downward trend in exports was due to further expansion in crude production and refinery capacity abroad, as well as the problem of dollar exchange. The large gain in domestic demand, compared with the low demand in 1949, reflected more normal weather, the increased number of oil-heating installations and of motor vehicles in use, expansion in the volume of industrial operations, and increased military requirements in the last half of the year.

Initiation of a major rearmament program after hostilities broke out in Korea in June resulted in a maximum output of civilian goods, combined with increasing military production. This involved a corresponding increase in fuel consumption, but supplies of oil proved ample to meet all needs.

---

[1] Certain terms, as utilized in this chapter, are more or less unique to the petroleum industry. Principal terms, and their meaning, are as follows:

Total demand.—A derived figure representing total new supply plus decreases or minus increases in reported stocks. Because there are substantial secondary and consumers' stocks that are not reported to the Bureau of Mines, this figure varies considerably from consumption.

Domestic demand.—Total demand less exports.

New supply of all oils.—The sum of crude oil production, plus production of natural gas liquids, plus benzol (coke-oven) used for motor fuel, plus imports of crude oil and products.

Transfers.—Crude oil conveyed to fuel oil stocks without processing, or reclassification of products from one product category to another.

All oils.—Crude petroleum, natural gas liquids, and their derivatives.

Principal products.—Gasoline, kerosine, distillate fuel oil, and residual fuel oil.

Exports.—Total shipments from continental United States, including shipments to United States Territories and possessions.

TABLE 1.—Salient statistics of crude petroleum, refined products, and natural gasoline in the United States, 1946–50 [1]

	1946	1947	1948	1949	1950 [2]
Crude petroleum:					
Domestic production……thousands of barrels [3]…	1,733,939	1,856,987	2,020,185	1,841,940	1,971,845
World production……do……	2,745,430	3,022,139	3,433,213	3,404,099	3,796,658
United States proportion of world production percent…	63	61	59	54	52
Imports [4]……thousands of barrels [3]…	86,066	97,532	129,093	153,686	177,714
Exports [5]……do……	42,436	46,355	39,736	33,069	34,798
Stocks, end of year:					
Gasoline-bearing crude……do……	224,473	224,929	246,572	} 253,356	248,463
California heavy crude……do……	5,703	5,725	10,055		
Runs to stills……do……	1,730,197	1,852,246	2,031,041	1,944,221	2,094,867
Total value of domestic production at wells thousands of dollars…	2,442,550	3,577,890	5,245,080	4,674,770	4,958,850
Average price per barrel at wells……	$1.41	$1.93	$2.60	$2.54	$2.51
Total producing oil wells in the United States Dec. 31……	421,460	426,280	437,880	448,680	465,820
Total oil wells completed in the United States during year (successful wells)……	15,851	17,999	22,585	22,042	24,430
Refined products:					
Imports [5]……thousands of barrels [3]…	51,610	61,857	59,051	81,873	131,435
Exports [5]……do……	110,687	118,122	94,938	86,307	76,128
Stocks, end of year……do……	271,937	[6] 265,850	[7] 343,537	[8] 342,932	326,892
Output of motor fuel……do……	776,583	839,998	921,923	962,417	1,024,448
Yield of gasoline……percent…	39.6	40.2	40.3	43.7	43.0
Completed refineries, end of year……	399	390	375	367	357
Daily crude oil capacity of refineries thousands of barrels [3]…	5,569	6,034	6,439	6,696	6,964
Average dealers' net price (excluding tax) of gasoline in 50 United States cities cents per gallon [9]…	10.40	12.33	14.55	15.05	15.10
Natural gas liquids:					
Production……thousands of barrels [3]…	115,739	132,173	146,721	157,086	181,558
Stocks, end of year……do……	4,981	4,296	5,579	6,831	7,355

[1] Data, including imports and exports, are for continental United States.
[2] Preliminary figures.
[3] 42 gallons per barrel.
[4] Bureau of Mines.
[5] Bureau of Mines, 1946. U. S. Department of Commerce, 1947–50. Exports include shipments to the Territories.
[6] Figure on new basis and comparable with succeeding years. Figure for 1947 on old basis and comparable with preceding years—267,103,000 barrels.
[7] Figure on new basis and comparable with succeeding years. Figure for 1948 on old basis and comparable with preceding years—345,650,000 barrels.
[8] Figure on new basis and comparable with succeeding years. Figure for 1949 on old basis and comparable with preceding years—342,704,000 barrels.
[9] American Petroleum Institute.

The most immediate problem was to increase the output of aviation fuels. Net production of aviation gasoline was increased from 17.6 million barrels in the first half of 1950 to 28.7 million in the last half of the year.

Fears of the possibility of oil rationing proved unfounded. Rationing in 1942 had been due primarily to the need to conserve rubber and to diversion of tankers from the Gulf-East Coast movement to carry oil to Europe. Neither of these factors was important in 1950.

The steps taken to reduce the stocks of refined products during the first half of 1950 were reversed in the last half of the year, when it became apparent that larger product stocks might be desirable.

The new supply of all oils in 1950 totaled 2,463 million barrels, an average of 6,747,000 barrels daily and a 10-percent gain compared with 1949. Daily production of crude petroleum averaged 5,402,000 barrels, a gain of 7 percent, but still 118,000 barrels daily below the record level of 1948. Production of light oils from natural gas set a new daily record of 497,000 barrels, a 15.6-percent increase over 1949. Imports of all oils averaged 847,000 barrels daily—a gain of about 31 percent from 1949, including an increase of about 16 percent in receipts of crude oil and 61 percent in receipts of petroleum products.

Total stocks of oils declined 20.4 million barrels in 1950, including a decrease of 4.9 million in crude-oil stocks, a gain of 0.5 million in natural-gasoline stocks, and a decline of 16.0 million in product stocks. The reduction in product stocks represented a decline of 21.2 million barrels in the California district and a gain of 5.2 million in other districts. The principal decline was in stocks of residual fuel oil and was related to liquidation of surplus stocks in California, in connection with large tanker shipments to the East Coast district, and to expansion in imports of residual fuel oil.

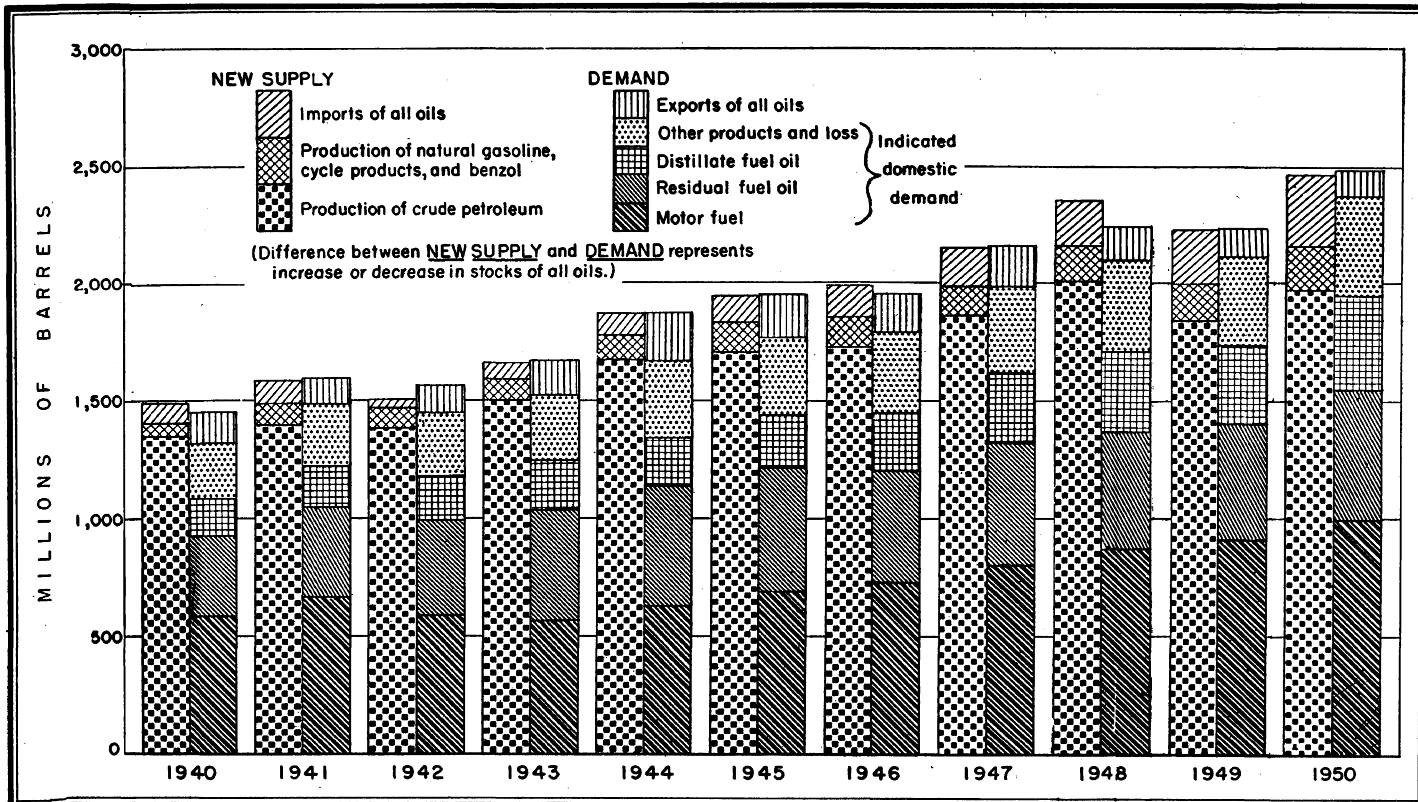

FIGURE 1.—Supply and demand of all oils in the United States, 1940–50.

TABLE 2.—Supply and demand of all oils [1] in continental United States, 1948 (total) and 1949–50 by months

[Thousands of barrels]

	1949													1948 (total)
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New supply:														
Domestic production:														
Crude petroleum	167, 016	150, 682	162, 399	150, 343	154, 250	147, 283	145, 530	148, 356	148, 286	155, 469	156, 496	155, 830	1, 841, 940	2, 020, 185
Natural gasoline, etc	13, 053	12, 127	12, 836	12, 397	12, 532	12, 013	12, 491	13, 142	13, 354	14, 033	14, 329	14, 779	157, 086	146, 721
Benzol, etc	11	11	11	11	11	11	11	11	11	30	30	30	189	358
Total production	180, 080	162, 820	175, 246	162, 751	166, 793	159, 307	158, 032	161, 509	161, 651	169, 532	170, 855	170, 639	1, 999, 215	2, 167, 264
Imports:														
Crude petroleum [2]	14, 131	12, 547	11, 085	11, 952	12, 669	11, 678	12. 988	12, 472	10, 845	15, 242	13, 036	15. 041	153, 686	129, 093
Refined products [3]	5, 355	4, 354	5, 306	5, 922	5, 561	6, 249	6, 400	6, 618	7, 948	9, 081	8, 332	10, 747	81, 873	59, 051
Total new supply	199, 566	179, 721	191, 637	180, 625	185, 023	177, 234	177, 420	180, 599	180, 444	193, 855	192, 223	196, 427	2, 234, 774	2, 355, 408
Increase (+) or decrease (−) in stocks	+2, 805	+5, 741	+555	+5, 835	+10, 383	+3, 649	−222	−10, 749	−4, 940	+7, 845	−4, 449	−19, 305	−2, 852	+107, 056
Demand:														
Total demand	196, 761	173, 980	191, 082	174, 790	174, 640	173, 585	177, 642	191, 348	185, 384	186, 010	196, 672	215, 732	2, 237, 626	2, 248, 352
Exports: [3]														
Crude petroleum	2, 127	1, 942	1, 866	3. 655	2, 872	3, 071	2, 866	3, 403	2, 619	2, 916	3, 010	2, 722	33, 069	39, 736
Refined products	8, 542	7, 872	8, 961	7, 954	8, 681	6, 964	5, 940	7, 814	5, 773	6, 636	5, 581	5, 589	86, 307	94, 938
Domestic demand:														
Motor fuel	63, 125	57, 980	73, 282	75, 318	81, 665	83, 374	82, 129	84, 707	80, 832	79, 327	76, 346	75, 628	913, 713	871, 270
Kerosine	12, 963	10, 592	9, 913	6, 605	4, 577	4, 531	5. 676	6. 315	6, 799	8, 269	11, 454	14, 978	102, 672	112, 220
Distillate fuel oil	41, 661	34, 976	32, 589	22, 157	17, 792	16, 664	19, 061	23, 276	22, 430	23, 141	30, 772	44, 759	329. 278	340, 576
Residual fuel oil	48, 097	42, 911	44, 543	38, 175	35, 760	34, 814	35, 583	38, 050	39, 675	41, 130	45, 816	51, 467	496, 021	500, 543
Lubricants	2. 597	2. 196	2, 426	2, 713	2, 752	3, 023	2, 699	3, 111	3, 026	2, 929	2 982	2, 647	33, 101	35, 983
Miscellaneous	17, 649	15, 511	17. 502	18, 213	20, 541	21, 144	23. 688	24, 672	24, 230	21, 662	20, 711	17, 942	243, 465	253, 086
Total domestic demand	186, 092	164, 166	180, 255	163, 181	163, 087	163, 550	168, 836	180, 131	176. 992	176, 458	188, 081	207, 421	2, 118, 250	2, 113, 678
Stocks:														
Crude petroleum	258, 648	265, 216	269, 341	272, 520	273, 912	274, 691	267, 586	260, 585	251, 689	250, 809	256, 010	253, 356	253, 356	256, 627
Natural gasoline, etc	6, 217	7, 028	7, 405	7, 253	7, 418	7, 031	7, 668	7. 391	7, 607	6, 923	7, 141	6, 831	6, 831	5, 579
Refined products	343, 683	342, 045	338, 098	340, 906	349, 732	352. 989	359. 235	355, 764	359, 504	368, 913	359, 045	342, 704	342, 704	343, 537
Total stocks	608, 548	614. 289	614, 844	620, 679	631, 062	634, 711	634, 489	623, 740	618, 800	626, 645	622, 196	602, 891	602, 891	605, 743

	1950 [4]													1949 (total)
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New supply:														
Domestic production:														
Crude petroleum	152,590	139,073	151,213	149,052	159,441	161,332	170,017	175,594	176,636	182,896	176,725	177,276	1,971,845	1,841,940
Natural gasoline, etc	15,095	13,587	14,569	13,999	14,229	14,237	14,985	15,442	15,459	16,469	16,251	17,236	181,558	157,086
Benzol, etc	21	21	17	17	17	17	17	7	7	7	5	5	158	189
Total production	167,706	152,681	165,799	163,068	173,687	175,586	185,019	191,043	192,102	199,372	192,981	194,517	2,153,561	1,999,215
Imports:														
Crude petroleum [2]	15,102	11,499	14,614	15,336	13,618	14,931	15,076	15,539	15,760	15,809	13,992	16,438	177,714	153,686
Refined products [3]	10,959	7,663	12,332	11,315	10,135	10,203	9,900	10,476	10,005	11,965	12,736	13,746	131,435	81,873
Total new supply	193,767	171,843	192,745	189,719	197,440	200,720	209,995	217,058	217,867	227,146	219,709	224,701	2,462,710	2,234,774
Increase (+) or decrease (−) in stocks	−10,662	−17,639	−23,747	−2,362	−404	+10,690	+8.481	+1,316	+16,320	+13,054	+4,773	−20,229	−20,409	−2,852
Demand:														
Total demand	204,429	189,482	216,492	192,081	197,844	190,030	201,514	215,742	201,547	214,092	214,936	244,930	2,483,119	2,237,626
Exports: [3]														
Crude petroleum	2,130	2,196	2.153	2,968	2.946	3,226	3,250	3,096	2,654	4,033	3,229	2,917	34,798	33,069
Refined products	5,168	5,815	6,269	6,467	6,327	6,109	6,303	5,953	6,940	6,586	6,727	7,464	76,128	86,307
Domestic demand:														
Motor fuel	66,908	63,366	78,739	80,348	89,033	90,170	91,707	94,537	86,766	89,126	82,718	81,063	994,481	913,713
Kerosine	13,906	11,413	12,939	8,371	5,700	4,629	6,926	7,035	7,920	9,486	12,737	16,817	117,879	102,672
Distillate fuel oil	43,406	39,484	42,604	28,806	25,123	19,705	23,864	26,785	24,864	29,320	35,411	55,343	394,715	329,278
Residual fuel oil	51,334	47,281	52,085	42,906	41,955	39,055	40,743	44,762	42,668	45,980	47,977	56,198	552,944	496,021
Lubricants	2,846	2,368	3,271	2,544	3,346	3,588	3,339	3,822	3,511	3,907	3,322	3,012	38,876	33,101
Miscellaneous	18,731	17,559	18,432	19,671	23,414	23,548	25,382	29,752	26,224	25,654	22,815	22,116	273,298	243,465
Total domestic demand	197,131	181,471	208,070	182,646	188,571	180,695	191,961	206,693	191,953	203,473	204,980	234,549	2,372,193	2,118,250
Stocks:														
Crude petroleum	246,610	243,750	241,230	244,605	239,877	242,287	240,270	237,393	242,311	246,424	249,525	248,463	248,463	253,356
Natural gasoline, etc	7,363	8,098	7,708	7,950	8,163	8,151	8,730	8,667	8,581	8,226	7,636	7,355	7,355	6,831
Refined products	338,484	322,970	302,133	296,154	300,265	308,557	318,476	322,732	334,220	343,516	345,778	326,892	326,892	[5] 342,932
Total stocks	592,457	574,818	551,071	548,709	548,305	558,995	567,476	568,792	585,112	598,166	602,939	582,710	582,710	[5] 603,119

[1] For definition of this and other terms used in the petroleum industry, see text footnote 1 at the beginning of this chapter.
[2] Bureau of Mines.
[3] U. S. Department of Commerce, except for exports to Alaska and Hawaii, which are Bureau of Mines data.
[4] Preliminary figures.
[5] Stocks on a new basis, for comparison with 1950, include an additional 228,000 barrels of distillate fuel oil in terminal storage on the east coast.

TABLE 3.—Demand for all oils [1] in continental United States, 1941–50

[Millions of barrels]

Year	Domestic demand	Exports	Total demand	Year	Domestic demand	Exports	Total demand
1941	1,485.8	108.8	1,594.6	1946	1,792.8	153.1	1,945.9
1942	1,449.9	116.9	1,566.8	1947	1,989.8	164.5	2,154.3
1943	1,521.4	150.0	1,671.4	1948	2,113.7	134.7	2,248.4
1944	1,671.3	207.6	1,878.9	1949	2,118.2	119.4	2,237.6
1945	1,772.7	183.0	1,955.7	1950 [2]	2,372.2	110.9	2,483.1

[1] See text footnote 1 at beginning of this chapter.
[2] Preliminary figures.

DEMAND

The total demand for all oils [2] increased from 2,238 million barrels in 1949 to 2,483 million in 1950; the gain of 245 million barrels included a decline of 8.5 million barrels in total exports and a gain of 254 million in domestic demand. The principal changes in exports were a decrease of 14.8 million barrels for gasoline and gains of 3.6 million for residual fuel oil and 1.3 million for lubricants. The major changes in domestic demand were gains of 80.8 million barrels for motor fuel, 65.4 million for distillate, 56.9 million for residual fuel oil, and 15.2 million for kerosine. The gain for all other products was 35.6 million barrels, including gains of 16.9 million barrels for liquefied gases, 9.3 million for asphalt, and 5.8 million for lubricants. A brief review of the trends in demand for the major oil products follows.

Motor Fuel.—The total demand for motor fuel rose from 953 million barrels in 1949 to 1,019 million in 1950, or about 7 percent. Exports declined from 39.3 million in 1949 to 24.5 million in 1950—nearly 38 percent. Domestic demand increased almost 9 percent—from 914 million in 1949 to 994 million in 1950. The decrease in exports reflects the rapid increase in refinery capacity abroad, particularly in western Europe. The steady upward trend in domestic demand indicates the increasing importance of motor transport and the fact that motor-fuel demand is less affected by fluctuation in weather or the volume of industrial operations than that of any other major product. A substantial part of the gain in 1950 was due to the sharp rise in military requirements for both aviation fuels and motor gasoline.

Residual Fuel Oil.—The total demand for residual fuel oil increased almost 12 percent—from 509 million barrels in 1949 to 569 million in 1950. Exports rose from 12.6 million barrels in 1949 to 16.2 million in 1950. Domestic demand increased 11.5 percent—from 496 million barrels in 1949 to 553 million in 1950. The domestic demand for residual fuel oil is affected materially by the volume of

[2] For definition, *see* footnote 1 at beginning of this chapter.

industrial operations and the relative cost of residual fuel oil compared with other fuels. The large gain in demand in 1950 was due to peak industrial activity, more normal weather, increased military requirements, and favorable factors in supply and competitive position.

The outstanding factor in the supply of residual fuel oil in 1950 was an increase in imports to 119 million barrels from 75 million in 1949, a gain of nearly 59 percent; the supply was further augmented by a decrease of 19.4 million barrels in stocks. The increase in imports and the decline in stocks provided for all the increase in demand; refinery output of residual fuel oil was almost static, the decline in yield from 21.7 percent in 1949 to 20.2 percent in 1950 offsetting the increase in crude runs.

Distillate Fuel Oil.—The total demand for distillate fuel oil increased from 342 million barrels in 1949 to 407 million in 1950, or about 19 percent. Exports showed a minor gain from 12.3 million barrels to 12.6 million. Domestic demand rose from 329 million barrels in 1949 to 395 million in 1950, or almost 20 percent.

The apparent high demand for distillate fuel oil is a result in part of comparison with the low demand of 1949, which was 3 percent below the domestic demand in 1948. Colder weather in 1950, compared with the abnormally mild weather in 1949, was a major factor in the increase in heating-oil requirements. Also important in increasing demand was the substantial increase in the number of new oil-heating installations.

Kerosine.—The total demand for kerosine rose from 105 million barrels in 1949 to 120 million in 1950—about 14 percent. Exports of kerosine declined from 2.5 million barrels to 2.0 million. Domestic demand increased from 103 million barrels in 1949 to 118 million in 1950—almost 15 percent compared with the 8.5-percent decline in 1949 from 1948. Demand for kerosine varies both with the over-all use of small space heaters and range-oil burners and with the relative substitution of No. 1 distillate fuel oil for kerosine in such apparatus.

Other Products.—The domestic demand for all other products rose almost 13 percent—from 277 million barrels in 1949 to 312 million in 1950. The domestic demand for liquefied gases for fuel and chemical uses increased from 68 million barrels to 85 million, a gain of almost 25 percent in 1950 compared with gains of 4.2 percent in 1949 and about 24 percent in 1948. The domestic demand for asphalt rose from 49 million barrels in 1949 to 59 million in 1950, or about 19 percent. The domestic demand for lubricants increased from 33 million barrels in 1949 to 39 million in 1950, or over 17 percent, compared with a decline of about 8 percent in 1949.

Demand by Calendar Quarters.—The high demand in the first half of 1950 compared with low demand in the same period of 1949 and the acceleration in demand in the last half of the year make a brief analysis by quarters of special interest.

In the first quarter of 1950 crude production averaged 4,921,000 barrels daily and refinery runs 5,380,000 barrels daily; both were at the lowest level of the year and materially under the rates in the first quarter of 1949. With total demand for all oils 8.6 percent above 1949, heavy liquidation of stocks resulted, amounting to a total decline of 52 million barrels, including about 12 million barrels in crude stocks and 40 million in other stocks.

In the second quarter, crude production averaged 5,163,000 barrels daily and crude runs 5,462,000 barrels daily, respectively about 4 and 6 percent above the rates in the second quarter of 1949. With the total demand for all oils gaining 10.9 percent above the second quarter of 1949, stocks of all oils increased only 7.9 million barrels—a gain of 1 million for crude and about 7 million for other oils. Even with this increase, however, stocks were not much above working levels at the end of the first half of 1950.

The start of Korean hostilities late in June and initiation of a major rearmament program resulted in increased oil demand and, as a consequence, in more desirable levels of oil in storage. In the third quarter, daily crude-oil output increased to 5,677,000 barrels and crude runs to 6,002,000 barrels, gains of about 18 and 14 percent, respectively, compared with the third quarter of 1949. The total demand for all oils was 11.6 percent over the same period of 1949. Stocks of all oils increased about 26 million barrels, all of the increase being in products rather than crude.

In the fourth quarter of 1950, total demand gained 12.6 percent compared with 1949, and crude production and runs to stills were record-breaking. Crude production averaged 5,836,000 barrels daily, a gain of about 15 percent compared with 1949; and crude runs averaged 6,102,000 barrels daily, or almost 14 percent above the last quarter of 1949. Total stocks of all oils declined 2.4 million barrels during the quarter, including an increase of 6.2 million in crude stocks and a decrease of 8.6 million in stocks of other oils.

With prospects of a further major increase in total oil demand of possibly 10 percent for 1951, consideration was being given to increasing the total supply of crude oil and to material expansion in refinery capacity.

Demand in United States Territories.—In computing domestic demand in continental United States, shipments from the United States to the Territories (and possessions) are included with exports, and any imports from foreign countries to the Territories are deleted from total imports. The major part of such shipments from the United States goes to Hawaii, Alaska, and Puerto Rico. Normally, Puerto Rico is the chief Territorial importer of foreign oils.

Table 4, in addition to giving imports and exports of continental United States, shows the supply of oil received by the Territories from the United States and from foreign sources. This supply, minus minor reexports, indicates their total demand. The indicated total supply of all oils in the Territories rose from 16,268,000 barrels in 1949 to 16,828,000 in 1950. Reexports to foreign countries amounted to 258,000 barrels in 1949 and 326,000 barrels in 1950, indicating a total net demand for petroleum products in the Territories of about 16.5 million barrels in 1950 compared with 16.0 million in 1949.

TABLE 4.—Imports and exports of crude petroleum and petroleum products, 1949–50 [1]

[Thousands of barrels]

Product	Imports					
	1949			1950 [2]		
	Continental United States	United States Territories	Total	Continental United States	United States Territories	Total
Gasoline		18	18	156	72	228
Kerosine				245	25	270
Distillate fuel oil	1,825	541	2,366	2,340	434	2,774
Residual fuel oil	75,175	2,283	77,458	119,186	2,435	121,621
Lubricants						
Wax						
Coke						
Asphalt	1,185	55	1,240	1,795	17	1,812
Other unfinished oils	3,688		3,688	7,713		7,713
Total	81,873	2,897	84,770	131,435	2,983	134,418
Crude petroleum [3]	153,686		153,686	177,714		177,714

Product	Exports					
	1949			1950 [2]		
	Foreign	United States Territories	Total	Foreign	United States Territories	Total
Motor fuel	33,754	5,593	39,347	18,620	5,896	24,516
Kerosine	1,819	714	2,533	1,269	774	2,043
Distillate fuel oil	9,843	2,452	12,295	10,189	2,372	12,561
Residual fuel oil	8,549	4,092	12,641	11,887	4,340	16,227
Lubricants: Grease	389	3	392	381	1	382
Oil	12,337	183	12,520	13,656	191	13,847
Wax	1,031		1,031	1,194	1	1,195
Coke	2,441	39	2,480	2,446	48	2,494
Asphalt	1,290	279	1,569	786	196	982
Misc. (inc. liquefied gases)	1,483	16	1,499	1,855	26	1,881
Total	72,936	13,371	86,307	62,283	13,845	76,128
Crude petroleum [1]	33,069		33,069	34,798		34,798

[1] Source: U. S. Department of Commerce, except for exports to Alaska and Hawaii, which are Bureau of Mines data.
[2] Preliminary figures.
[3] Bureau of Mines data.

WORLD OIL SUPPLY

World production of crude petroleum in 1950 amounted to 3,797 million barrels compared with 3,404 million in 1949. The total gain of 393 million barrels comprises an increase of 130 million barrels for the United States and a gain of 263 million for the rest of the world. The largest gains in foreign production were: Venezuela, 64.5 million barrels; Iran, 37.8 million; Kuwait, 35.7 million; U. S. S. R., 28.5 million (estimated); Saudi Arabia, 25.5 million; Iraq, 19.0 million; Mexico, 11.5 million; Qatar, 11.5 million; and Canada, 7.8 million.

The United States produced 61.4 percent of the world's crude oil in 1947, 58.8 percent in 1948, 54.1 percent in 1949, and 51.9 percent in 1950. The excess of crude imports into the United States over crude exports has steadily increased from 51.2 million barrels in 1947 to 89.4 million in 1948, 120.6 million in 1949, and 142.9 million in 1950.

RESERVES

The Committee on Petroleum Reserves, American Petroleum Institute, estimated proved reserves of crude in the United States on December 31, 1950, at 25,268 million barrels. These estimates include only oil recoverable under existing economic and operating conditions.

The increase in net crude reserves in 1950 was 619 million barrels. Estimated new reserves added in 1950 were 2,563 million barrels, of which 1,998 million were an upward revision of reserves due to extensions of old pools and revisions of previous estimates, and 565 million were new reserves discovered in 1950 in new fields and in new pools in old fields. Deduction of an estimated production of 1,944 million barrels of crude during 1950 (exclusive of condensate) results in the indicated net gain.

TABLE 5.—Estimates of proved oil reserves in the United States, on Dec. 31, 1944–50, by States [1]

[Millions of barrels]

State	1944	1945	1945 [2]	1946 [2]	1947 [2]	1948 [2]	1949 [2]	1950 [2]
Eastern States:								
Illinois	321	350	350	351	355	393	468	564
Indiana	31	41	41	44	46	49	50	57
Kentucky	41	57	57	59	65	59	56	56
Michigan	65	64	64	69	70	69	66	79
New York	86	81	81	76	71	67	63	59
Ohio	32	30	30	29	29	29	28	27
Pennsylvania	123	110	110	98	123	110	103	106
West Virginia	41	39	39	36	36	37	38	39
Total	740	772	772	762	795	813	872	987
Central and Southern States:								
Arkansas	293	304	288	267	297	300	297	342
Kansas	602	542	542	545	563	674	738	732
Louisiana	1,573	1,690	1,559	1,652	1,791	1,869	1,910	2,185
Mississippi	209	267	257	270	304	365	403	386
New Mexico	563	512	512	544	530	552	592	592
Oklahoma	970	890	889	898	953	1,250	1,330	1,397
Texas	11,375	11,470	10,835	11,647	11,777	12,484	13,510	13,582
Total	15,585	15,675	14,882	15,823	16,215	17,494	18,780	19,216
Mountain States:								
Colorado	89	260	260	300	382	366	345	339
Montana	112	108	108	104	115	119	112	111
Utah						1	16	22
Wyoming	582	600	600	589	679	716	692	841
Total	783	968	968	993	1,176	1,202	1,165	1,313
Pacific Coast States: California	3,344	3,410	3,318	3,294	3,295	3,764	3,823	3,734
Other States	1	2	2	2	7	7	9	18
Total United States	20,453	20,827	19,942	20,874	21,488	23,280	24,649	25,268

[1] From reports of Committee on Petroleum Reserves, American Petroleum Institute, of the amount of crude oil that may be extracted by present methods from fields completely developed or sufficiently explored to permit reasonably accurate calculations. The change in reserves during any year represents total new discoveries, extensions, and revisions, minus production.

[2] New basis; excludes condensate.

The principal changes in net reserves of crude in 1950 were gains of 275 million barrels for Louisiana, 149 million for Wyoming, 96 million for Illinois, 72 million for Texas, 67 million for Oklahoma, 45 million for Arkansas, and 13 million for Michigan. The principal declines were 89 million barrels for California, 17 million for Mississippi, and 6 million each for Kansas and Colorado.

As of December 31, 1950, Texas had 53.8 percent of total estimated reserves, California 14.8 percent, Louisiana 8.6 percent, and Oklahoma 5.5 percent—82.7 percent for the four States combined.

The total proved reserves of natural-gas liquids, not included in the crude reserves, were 4,268 million barrels on December 31, 1950, a gain of 539 million during the year. Proved reserves for crude-oil and natural-gas liquids combined were 29,536 million barrels on December 31, 1950, compared with 28,378 million on December 31, 1949.

CRUDE PETROLEUM

SUPPLY AND DEMAND

The new supply of crude petroleum in 1950 included a domestic production of 1,971.8 million barrels, or 5,402,000 daily, and imports of 177.7 million barrels, or 487,000 daily. Compared with 1949, crude production increased 7.1 and imports 15.7 percent. Production, however, was still 118,000 barrels daily below the 1948 record. Total stocks of crude petroleum decreased 13,000 barrels daily in 1950 compared with a decline of 9,000 barrels daily in 1949 and a gain of 71,000 barrels daily in 1948.

The total demand [3] for crude in 1950 set a new record of 2,154.5 million barrels, or a daily average of 5,903,000 barrels, a gain of 427,000 barrels or 7.8 percent over 1949. The demand for domestic crude rose from 5,052,000 barrels daily in 1949 to 5,419,000 in 1950, an increase of 367,000 barrels or 7.3 percent. The demand for foreign crude rose from 424,000 barrels daily in 1949 to 483,000 in 1950, an increase of 59,000 barrels daily or 13.9 percent. The demand for domestic crude was 41,000 barrels daily below the record level of 1948, while the demand for foreign crude continued to expand.

Although the indicated demand for crude oil was inflated in 1948 by the addition of 79.8 million barrels to stocks of refined products, it was reduced by declines in product stocks of 0.8 million barrels in 1949 and 16.1 million in 1950. In an effort to reduce product stocks to what were considered more normal levels, refining operations were kept at a relatively low rate in the first half of 1950, with the result that these stocks decreased 40.8 million barrels in the first quarter and increased only 6.4 million in the second. With opening of the Korean hostilities and indication of a much larger total demand for all oils than had been anticipated for 1950, refinery operations were accelerated to record rates in the last half of the year, and stocks of refined products were increased 25.7 million barrels in the third quarter and reduced only 7.3 million barrels in the last quarter.

Total runs of crude oil to stills rose from 1,944.2 million barrels in 1949 to 2,094.9 million in 1950, crude exports increased from 33.1 million barrels to 34.8 million, transfers of crude to residual and distillate fuel-oil uses increased from 7.5 million barrels to 7.9 million, and crude losses increased from 14.2 million barrels to 16.9 million.

[3] For definition, *see* footnote 1 at beginning of this chapter.

TABLE 6.—Supply and demand [1] for crude petroleum in continental United States, 1946–50

[Thousands of barrels]

	1946	1947	1948	1948 [2]	1949	1950 [3]
Production	1,733,939	1,856,987	2,020,185	2,020,185	1,841,940	1,971,845
Imports [4]	86,066	97,532	129,093	129,093	153,686	177,714
Total new supply	1,820,005	1,954,519	2,149,278	2,149,278	1,995,626	2,149,559
Increase (+) or decreases (−) in stocks [5]	+6,917	+478	+25,973	+25,973	−3,271	−4,893
Demand: [1]						
Domestic crude	1,728,102	1,856,479	1,998,357	1,998,357	1,844,173	1,978,035
Foreign crude	84,986	97,562	124,948	124,948	154,724	176,417
Total demand	1,813,088	1,954,041	2,123,305	2,123,305	1,998,897	2,154,452
Runs to stills:						
Domestic	1,645,845	1,754,987	1,907,027	1,924,335	1,789,756	1,918,854
Foreign	84,352	97,259	124,014	124,014	154,465	176,013
Exports [6]	42,436	46,355	39,736	39,736	33,069	34,798
Transfers to fuel oil: [1]						
Distillate	3,123	3,263	3,543	3,403	2,701	2,537
Residual	23,142	27,091	23,847	6,699	4,750	5,325
Other fuel uses and losses	14,190	25,086	25,138	25,118	14,156	16,925
Total demand	1,813,088	1,954,041	2,123,305	2,123,305	1,998,897	2,154,452

[1] For definition, *see* text footnote 1 at the beginning of this chapter.
[2] Includes California data on a new basis to compare with subsequent years.
[3] Preliminary figures.
[4] Bureau of Mines data.
[5] Inclusive of heavy crude in California, 1946–48; separation discontinued in 1949.
[6] Bureau of Mines, 1946; U. S. Department of Commerce, 1947–50.

PRODUCTION

GENERAL

Production of crude petroleum in the United States reached a peak of 2,020.2 million barrels in 1948, declined to 1,841.9 million in 1949, and rose to 1,971.8 million in 1950.

The increase of 129.9 million barrels in crude production in 1950 compared with 1949 represented gains in most of the important producing States. The principal increases were 84.4 million barrels for Texas, 18.3 million for Louisiana, 13.2 million for Oklahoma, 12.6 million for Wyoming, and 5.7 million barrels for Kansas. The most important declines were 5.3 million barrels for California and 2.6 million for Illinois.

Fourteen States produced over 10 million barrels of crude in 1950, with Kentucky added to the list. These States produced 98.3 percent of the total. Seven States produced over 50 million barrels of oil in 1950; these States combined produced 89.3 percent of the total in 1950 compared with 88.7 percent in 1949. Texas ranked first with 42.0 percent of the total national output in 1950, California second with 16.6 percent, Louisiana third with 10.6 percent, Oklahoma fourth with 8.4 percent, Kansas fifth with 5.5 percent, Illinois sixth with 3.1 percent, and Wyoming seventh with 3.1 percent. California and Illinois were the only States in this group to show declines in the percentage of total output compared with 1949.

The relative positions of the various oil-producing States from 1941 to 1950 are shown in table 11.

TABLE 7.—Petroleum produced in the United States, 1946–50, and total, 1859–1950, by States[1]

[Thousands of barrels]

	1946	1947	1948	1949	1950 [2]	1859–1950 (total)
Production:						
Alabama	380	396	466	462	735	2, 663
Arkansas	28, 375	29, 948	31, 682	29, 986	31, 108	796, 102
California	314, 713	333, 132	340, 074	332, 942	327, 627	8, 619, 618
Colorado	11, 856	15, 702	17, 862	23, 587	23, 353	147, 044
Florida	57	259	290	441	487	1, 580
Illinois	75, 297	66, 459	64, 808	64, 501	61, 922	1, 506, 210
Indiana	6, 726	6, 095	6, 974	9, 696	9, 942	199, 966
Kansas	97, 218	105, 132	110, 908	101, 868	107, 586	[3] 2, 125, 878
Kentucky	10, 578	9, 397	8, 801	8, 803	10, 301	[4] 252, 166
Louisiana	143, 669	160, 128	181, 458	190, 826	209, 116	2, 561, 167
Michigan	17, 074	16, 215	16, 871	16, 517	15, 811	[5] 322, 232
Mississippi	24, 298	34, 925	45, 761	37, 966	38, 258	284, 081
Montana	8, 825	8, 742	9, 382	9, 118	8, 112	168, 254
Nebraska	293	229	215	330	1, 547	7, 384
New Mexico	36, 814	40, 926	47, 969	47, 645	48, 001	[6] 683, 029
New York	4, 863	4, 762	4, 621	4, 425	4, 143	[7] 166, 601
Ohio	2, 908	3, 108	3, 600	3, 483	3, 333	620, 949
Oklahoma	134, 794	141, 019	154, 455	151, 660	164, 899	6, 235, 409
Pennsylvania	12, 996	12, 690	12, 667	11, 374	11, 812	1, 135, 526
Texas	760, 215	820, 210	903, 498	744, 834	829, 231	13, 722, 216
West Virginia	2, 929	2, 617	2, 692	2, 839	2, 788	440, 940
Wyoming	38, 977	44, 772	55, 032	47, 890	60, 457	914, 624
Other States [8]	84	124	99	747	1, 276	3, 720
Total	1, 733, 939	1, 856, 987	2, 020, 185	1, 841, 940	1, 971, 845	40, 917, 359
Value at wells:						
Total (thousands of dollars)	2, 442, 550	3, 577, 890	5, 245, 080	4, 674, 770	4, 958, 850	58, 286, 328
Average per barrel	$1. 41	$1. 93	$2. 60	$2. 54	$2. 51	$1. 42

[1] For detailed figures by States, 1859–1935, see Minerals Yearbook, 1937, p. 1008.
[2] Preliminary figures.
[3] Oklahoma included with Kansas in 1905 and 1906.
[4] Includes Tennessee, 1883–1907.
[5] Figures represent 1925–50 production only; earlier years included under "Other States."
[6] Figures represent 1924–50 production only; earlier years included under "Other States."
[7] Early production in New York included with Pennsylvania.
[8] Includes Alaska, 1912–33; Arkansas, 1920; Michigan, 1900–19; Missouri, 1899–1911, 1913–16, 1919–23, 1932–50; New Mexico, 1913, 1919–23; Tennessee, 1916–50; Utah, 1907–11, 1920, 1924–41, 1948–50; Virginia, 1943–50.

TABLE 8.—Production of crude petroleum in the United States in 1949–50, by States and months

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Alabama	38	35	39	34	35	36	36	37	42	38	43	49	462
Arkansas	2, 637	2, 450	2, 662	2, 579	2, 662	2, 351	2, 273	2, 401	2, 339	2, 442	2, 550	2, 640	29, 986
California [1]	29, 173	26, 536	29, 447	28, 276	28, 749	27, 627	28, 121	27, 800	26, 968	27, 188	26, 150	26, 907	332, 942
Colorado	1, 992	1, 747	1, 955	1, 956	1, 990	1, 882	2, 134	2, 098	1, 976	2, 023	1, 921	1, 913	23, 587
Florida	39	33	36	44	39	41	44	45	31	29	31	29	441
Illinois	5, 247	4, 907	5, 480	5, 248	5, 509	5, 369	5, 362	5, 604	5, 461	5, 445	5, 389	5, 480	64, 501
Indiana	667	620	735	734	855	792	804	864	845	941	915	924	9, 696
Kansas	8, 796	8, 091	9, 383	8, 727	8, 851	8, 282	7, 764	7, 971	8, 093	8, 590	8, 651	8, 669	101, 868
Kentucky	711	628	743	699	739	688	722	723	755	806	799	790	8, 803
Louisiana	16, 115	14, 659	15, 893	15, 579	16, 555	15, 463	15, 444	15, 515	15, 250	16, 713	16, 569	17, 071	190, 826
Michigan	1, 463	1, 269	1, 406	1, 338	1, 288	1, 310	1, 342	1, 413	1, 421	1, 420	1, 388	1, 459	16, 517
Mississippi	3, 580	3, 028	3, 383	3, 286	3, 376	2, 990	3, 073	3, 124	2, 990	3, 069	3, 017	3, 050	37, 966
Montana	751	656	810	815	835	807	784	760	732	742	726	700	9, 118
Nebraska	21	18	20	20	17	18	28	23	25	49	41	50	330
New Mexico	4, 022	3, 787	4, 210	3, 885	4, 141	4, 013	3, 875	3, 924	3, 782	4, 050	3, 920	4, 036	47, 645
New York	371	362	392	371	363	373	362	388	366	361	350	366	4, 425
Ohio	263	267	304	287	288	321	281	315	293	293	288	283	3, 483
Oklahoma	13, 223	11, 831	13, 061	12, 631	12, 956	12, 163	12, 075	12, 402	12, 115	12, 979	13, 003	13, 221	151, 660
Pennsylvania	983	916	1, 029	970	956	959	919	980	922	940	884	916	11, 374
Texas	72, 602	65, 346	67, 277	58, 764	59, 771	57, 572	55, 724	57, 444	59, 397	62, 865	65, 435	62, 637	744, 834
Utah	12	10	18	21	41	49	58	73	78	101	93	83	637
West Virginia	212	209	233	226	235	238	236	254	247	260	247	242	2, 839
Wyoming	4, 090	3, 270	3, 875	3, 845	3, 990	3, 930	4, 059	4, 187	4, 148	4, 115	4, 076	4, 305	47, 890
Other States	8	7	8	8	9	9	10	11	10	10	10	10	[2] 110
Total: 1949	167, 016	150, 682	162, 399	150, 343	154, 250	147, 283	145, 530	148, 356	148, 286	155, 469	156, 496	155, 830	1, 841, 940
1948	164, 098	155, 577	167, 868	164, 726	170, 705	166, 448	171, 369	173, 015	163, 244	174, 972	170, 777	177, 386	2, 020, 185
Daily average, 1949	5, 388	5, 382	5, 239	5, 011	4, 976	4, 909	4, 695	4, 786	4, 943	5, 015	5, 217	5, 027	5, 046
Pennsylvania Grade (included above)	1, 728	1, 650	1, 838	1, 732	1, 724	1, 758	1, 680	1, 805	1, 704	1, 727	1, 646	1, 685	20, 677

1950 [3]													
Alabama	49	44	46	49	52	58	60	75	67	75	76	84	735
Arkansas	2,668	2,413	2,649	2,566	2,654	2,580	2,635	2,678	2,564	2,644	2,493	2,564	31,108
California [1]	26,894	24,188	26,582	25,735	27,020	26,440	27,339	27,878	27,656	29,462	28,708	29,725	327,627
Colorado	1,890	1,694	1,850	1,835	1,871	1,782	1,882	1,872	1,916	2,188	2,247	2,326	23,353
Florida	32	28	31	31	29	47	46	51	48	46	52	46	487
Illinois	5,120	4,826	5,466	5,038	5,289	5,114	5,157	5,399	5,196	5,303	4,966	5,048	61,922
Indiana	732	728	848	832	857	831	869	881	840	889	816	819	9,942
Kansas	8,381	7,832	9,004	8,470	9,042	9,051	9,712	9,052	9,212	9,343	9,137	9,350	107,586
Kentucky	688	648	840	803	914	857	887	925	919	1,021	896	903	10,301
Louisiana	17,376	15,873	16,578	15,537	16,708	17,040	18,180	18,134	17,900	18,592	18,346	18,852	209,116
Michigan	1,383	1,252	1,396	1,309	1,415	1,331	1,333	1,357	1,267	1,310	1,219	1,239	15,811
Mississippi	3,029	2,753	3,119	2,938	3,194	3,304	3,388	3,406	3,293	3,371	3,232	3,231	38,258
Montana	610	623	690	645	695	683	687	697	670	693	681	738	8,112
Nebraska	56	54	64	72	84	96	154	105	171	227	215	249	1,547
New Mexico	4,069	3,631	3,896	3,751	4,030	3,903	4,070	4,174	4,098	4,158	4,008	4,213	48,001
New York	365	305	362	320	372	351	338	362	341	354	331	342	4,143
Ohio	282	250	292	264	290	305	288	310	272	303	228	249	3,333
Oklahoma	12,209	11,614	12,405	12,524	13,235	13,621	14,312	14,833	14,561	15,254	14,869	15,462	164,899
Pennsylvania	954	846	971	925	1,024	1,022	1,005	1,069	1,011	1,067	961	957	11,812
Texas	60,809	54,758	58,712	60,417	65,505	67,719	72,302	76,686	79,078	80,861	77,656	74,728	829,231
Utah	87	88	93	101	102	100	103	102	98	112	108	114	1,208
West Virginia	240	220	246	234	245	238	230	249	232	248	194	212	2,788
Wyoming	4,658	4,401	5,066	4,651	4,807	4,855	5,034	5,292	5,222	5,368	5,282	5,821	60,457
Other States	9	4	7	5	7	4	6	7	4	7	4	4	[4] 68
Total: 1950	152,590	139,073	151,213	149,052	159,441	161,332	170,017	175,594	176,636	182,896	176,725	177,276	1,971,845
1949	167,016	150,682	162,399	150,343	154,250	147,283	145,530	148,356	148,286	155,469	156,496	155,830	1,841,940
Daily average, 1950	4,922	4,967	4,878	4,968	5,143	5,378	5,484	5,664	5,888	5,900	5,891	5,719	5,402
Pennsylvania Grade (included above)	1,723	1,515	1,750	1,632	1,802	1,770	1,735	1,853	1,727	1,830	1,598	1,646	20,581

[1] American Petroleum Institute.
[2] Missouri (40), Tennessee (18), and Virginia (43).
[3] Preliminary figures.
[4] Missouri (28), Tennessee (20), and Virginia (20).

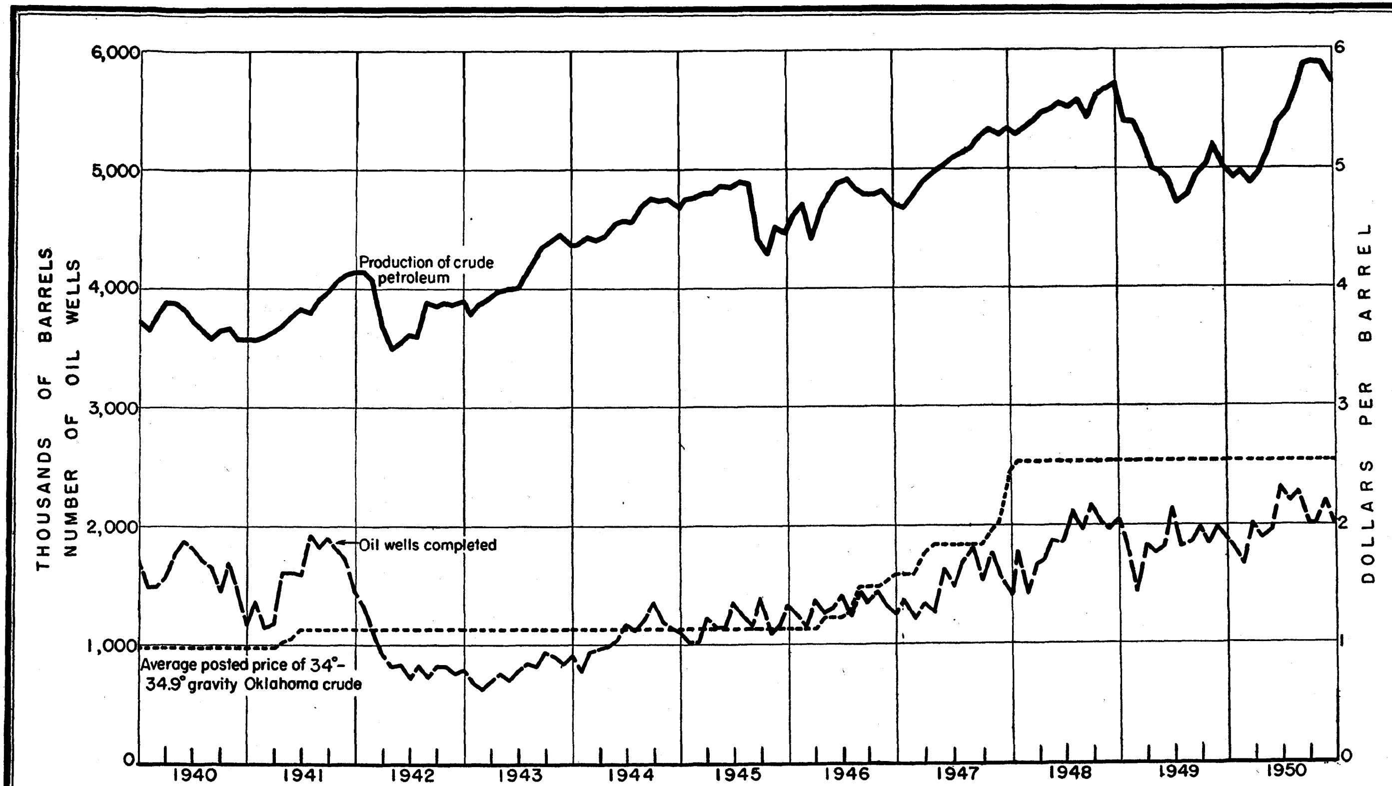

FIGURE 2.—Daily average production of crude petroleum, total number of oil wells completed, and average posted price per barrel of selected grade of Oklahoma crude petroleum in the United States, 1940–50, by months.

TABLE 9.—Supply of and demand for crude petroleum in continental United States, 1949–50

[Thousands of barrels]

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Supply: Production	167,016	150,682	162,399	150,343	154,250	147,283	145,530	148,356	148,286	155,469	156,496	155,830	1,841,940
Imports [1]	14,131	12,547	11,085	11,952	12,669	11,678	12,988	12,472	10,845	15,242	13,036	15,041	153,686
Total new supply	181,147	163,229	173,484	162,295	166,919	158,961	158,518	160,828	159,131	170,711	169,532	170,871	1,995,626
Change in stocks: Domestic	+1,256	+5,120	+5,940	+2,539	+1,557	+1,132	−7,139	−6,613	−7,417	−2,298	+5,547	−1,857	−2,233
Foreign	+765	+1,448	−1,815	+640	−165	−353	+34	−388	−1,479	+1,418	−346	−797	−1,038
Demand: Domestic	165,760	145,562	156,459	147,804	152,693	146,151	152,669	154,969	155,703	157,767	150,949	157,687	1,844,173
Foreign	13,366	11,099	12,900	11,312	12,834	12,031	12,954	12,860	12,324	13,824	13,382	15,838	154,724
Runs to stills: Domestic	161,953	142,364	153,036	142,930	148,249	142,508	147,162	149,314	150,111	152,761	145,413	153,955	1,789,756
Foreign	13,342	11,076	12,883	11,293	12,804	12,031	12,926	12,848	12,318	13,807	13,369	15,768	154,465
Exports [2]	2,127	1,942	1,866	3,655	2,872	3,071	2,866	3,403	2,619	2,916	3,010	2,722	33,069
Transfers: Distillate	283	238	245	254	217	206	218	209	194	214	200	223	2,701
Residual	578	491	397	396	463	363	374	452	278	337	293	328	4,750
Losses	843	550	932	588	922	3	2,077	1,603	2,507	1,556	2,046	529	14,156
1950 [3]													
Supply: Production	152,590	139,073	151,213	149,052	159,441	161,332	170,017	175,594	176,636	182,896	176,725	177,276	1,971,845
Imports [1]	15,102	11,499	14,614	15,336	13,618	14,931	15,076	15,539	15,760	15,809	13,992	16,438	177,714
Total new supply	167,692	150,572	165,827	164,388	173.059	176,263	185,093	191,133	192,396	198,705	190,717	193,714	2,149,559
Change in stocks: Domestic	−7,122	−2,094	−2,348	+1,889	−3,946	+2,258	−2,662	−1,981	+5,204	+3,369	+3,300	−2,057	−6,190
Foreign	+376	−766	−172	+1,486	−782	+152	+645	−896	−286	+744	−199	+995	+1,297
Demand: Domestic	159,712	141,167	153,561	147,163	163,387	159,074	172,679	177,575	171,432	179,527	173,425	179,333	1,978,035
Foreign	14,726	12,265	14,786	13,850	14,400	14,779	14,431	16,435	16,046	15,065	14,191	15,443	176,417
Runs to stills: Domestic	155,283	136,591	150,682	141,969	157,228	154,901	167,907	171,662	165,804	173,340	168,417	175,070	1,918,854
Foreign	14,704	12,246	14,736	13,828	14,371	14,762	14,423	16,416	15,974	15,053	14,122	15,378	176,013
Exports [2]	2,130	2,196	2,153	2,968	2,946	3,226	3,250	3,096	2,654	4,033	3,229	2,917	34,798
Transfers: Distillate	229	192	204	193	196	203	204	223	209	221	226	237	2,537
Residual	535	373	347	383	432	440	420	525	440	525	443	462	5,325
Losses	1,557	1,834	225	1,672	2,614	321	906	2,088	2,397	1,420	1,179	712	16,925

[1] Bureau of Mines. [2] U. S. Department of Commerce, except Alaska and Hawaii, which are Bureau of Mines data. [3] Preliminary figures.

TABLE 10.—Production of crude petroleum in 1950, by PAW districts and States, by calendar quarters [1]

[Thousands of barrels]

District and State	1st	2d	3d	4th	January-December 1950	January-December 1949
District 1:						
Florida	91	107	145	144	487	441
New York	1,032	1,043	1,041	1,027	4,143	4,425
Pennsylvania	2,771	2,971	3,085	2,985	11,812	11,374
Virginia	6	5	5	4	20	43
West Virginia	706	717	711	654	2,788	2,839
Total district 1	4,606	4,843	4,987	4,814	19,250	19,122
District 2:						
Illinois	15,412	15,441	15,752	15,317	61,922	64,501
Indiana	2,308	2,520	2,590	2,524	9,942	9,696
Kansas	25,217	26,563	27,976	27,830	107,586	101,868
Kentucky	2,176	2,574	2,731	2,820	10,301	8,803
Michigan	4,031	4,055	3,957	3,768	15,811	16,517
Nebraska	174	252	430	691	1,547	330
Ohio	824	859	870	780	3,333	3,483
Oklahoma	36,228	39,380	43,706	45,585	164,899	151,660
Other	14	11	12	11	[2] 48	[3] 67
Total district 2	86,384	91,655	98,024	99,326	375,389	356,925
District 3:						
Alabama	139	159	202	235	735	462
Arkansas	7,730	7,800	7,877	7,701	31,108	29,986
Louisiana	49,827	49,285	54,214	55,790	209,116	190,826
Gulf Coast	38,627	38,292	43,205	44,752	164,876	146,433
Rest of State	11,200	10,993	11,009	11,038	44,240	44,393
Mississippi	8,901	9,436	10,087	9,834	38,258	37,966
New Mexico	11,596	11,684	12,342	12,379	48,001	47,645
Southeastern	11,472	11,559	12,171	12,232	47,434	47,310
Northwestern	124	125	171	147	567	335
Texas	174,279	193,641	228,066	233,245	829,231	744,834
Gulf Coast	42,382	46,405	54,025	55,327	198,139	189,592
West Texas	55,864	64,084	82,392	84,562	286,902	228,560
East Texas (proper)	20,774	24,358	26,328	26,765	98,225	93,951
Panhandle	8,287	8,315	8,269	8,185	33,056	33,076
Rest of State	46,972	50,479	57,052	58,406	212,909	199,655
Total district 3	252,472	272,005	312,788	319,184	1,156,449	1,051,719
District 4:						
Colorado	5,434	5,488	5,670	6,761	23,353	23,587
Montana	1,923	2,023	2,054	2,112	8,112	9,118
Utah	268	303	303	334	1,208	637
Wyoming	14,125	14,313	15,548	16,471	60,457	47,890
Lance Creek	796	816	806	829	3,247	2,862
Salt Creek	963	1,063	1,071	1,053	4,150	3,937
Rest of State	12,366	12,434	13,671	14,589	53,060	41,091
Total district 4	21,750	22,127	23,575	25,678	93,130	81,232
District 5 (California):						
Coalinga	7,606	7,707	7,933	7,960	31,206	33,267
Kettleman Hills	2,737	2,621	2,552	2,557	10,467	11,739
Wilmington	10,089	11,198	11,959	12,981	46,227	43,509
Rest of State	57,232	57,669	60,429	64,397	239,727	244,427
Total district 5	77,664	79,195	82,873	87,895	327,627	332,942
Total United States [4]	442,876	469,825	522,247	536,897	1,971,845	1,841,940

[1] Preliminary figures.
[2] Includes Missouri (28) and Tennessee (20).
[3] Includes Missouri (49) and Tennessee (18).
[4] Includes some field condensate.

TABLE 11.—Percentage of total crude petroleum produced in the United States 1941–50, by States

State	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950 [1]
Texas	36.1	34.8	39.5	44.5	44.0	43.8	44.2	44.7	40.4	42.0
California	16.4	17.9	18.9	18.6	19.1	18.2	17.9	16.8	18.1	16.6
Louisiana	8.3	8.3	8.2	7.7	7.7	8.3	8.6	9.0	10.4	10.6
Oklahoma	11.0	10.2	8.2	7.4	8.1	7.8	7.6	7.7	8.2	8.4
Kansas	5.9	7.0	7.0	5.9	5.6	5.6	5.7	5.5	5.5	5.5
Illinois	9.4	7.7	5.5	4.6	4.4	4.3	3.6	3.2	3.5	3.1
Wyoming	2.1	2.4	2.3	2.0	2.1	2.2	2.4	2.7	2.6	3.1
New Mexico	2.8	2.3	2.6	2.4	2.2	2.1	2.2	2.4	2.6	2.4
Mississippi	1.1	2.1	1.2	1.0	1.1	1.4	1.9	2.3	2.1	1.9
Arkansas	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.6	1.6	1.6
Colorado	.2	.1	.2	.2	.3	.7	.8	.9	1.3	1.2
Michigan	1.2	1.6	1.4	1.1	1.0	1.0	.9	.8	.9	.8
Pennsylvania	1.2	1.3	1.0	.8	.7	.8	.7	.6	.6	.6
Other States	2.4	2.4	2.2	2.0	2.0	2.2	1.9	1.8	2.2	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary figures.

TABLE 12.—Production of crude petroleum in leading fields in the United States, 1949–50, and total production since discovery, in thousands of barrels

[Oil and Gas Journal]

Field	State	1949	1950	Total since discovery [1]
East Texas	Texas	93, 589	97, 609	2, 777, 412
Wilmington	California	43, 655	46, 353	506, 822
Coalinga	do	27, 112	23, 260	643, 101
Ventura Avenue	do	21, 133	20, 944	397, 591
Huntington Beach	do	21, 116	20, 558	458, 720
Rangely	Colorado	19, 549	18, 806	75, 501
Wasson	Texas	19, 278	18, 546	216, 076
T-X-L	do	16, 474	13, 532	76, 742
Bradford-Allegany [2]	Pennsylvania-New York	13, 305	13, 423	599, 645
Hastings	Texas	14, 308	13, 243	196, 457
Slaughter	do	[3] 22,822	12, 866	176, 474
Buena Vista	California	13, 962	12, 033	389, 940
Goldsmith	Texas	9, 141	11, 998	113, 221
Conroe	do	11, 633	11, 991	293, 201
Fullerton	do	10, 069	11, 707	72, 393
Midway-Sunset	California	12, 749	11, 414	760, 196
Keystone	Texas	11, 029	11, 246	87, 668
Webster	do	13, 144	11, 235	150, 017
Levelland	do	(4)	10, 923	29, 932
Kettleman-North Dome	California	11, 740	10, 480	372, 373
Hawkins	Texas	11, 453	10, 440	118, 284
Velma	Oklahoma	10, 134	10, 227	53, 376
Thompson	Texas	11, 734	10, 198	152, 917
Seeligson	do	8, 641	9, 372	76, 445
Trapp	Kansas	8, 905	8, 645	123, 248
Sholem Alechem	Oklahoma	6, 497	8, 545	62, 856
Cuyama-South	California	1, 188	8, 465	9, 653
Long Beach	do	8, 356	8, 450	751, 373
Coles Levee	do	8, 510	8, 420	73, 623
Russell Ranch	do	6, 885	7, 959	15, 678
Delta Farms	Louisiana	7, 570	7, 653	39, 068
Lake St. John	do	8, 080	7, 514	37, 187
McElroy	Texas	8, 146	7, 507	201, 189
Louden	Illinois	6, 077	7, 436	157, 143
Van	Texas	8, 312	7, 345	211, 119
Diamond M	do	678	6, 904	7, 582
Oklahoma City	Oklahoma	7, 703	6, 785	675, 265
Anahuac	Texas	7, 090	6, 785	101, 036
Kern	California	7, 014	6, 488	384; 928
Elk Basin	Wyoming-Montana	7, 105	6, 485	55, 445
Dollarhide	Texas	4, 615	6, 432	15, 277
Cowden-North	do	6, 109	6, 223	87, 797
Monument	New Mexico	6, 488	6, 168	106, 782
Cranfield	Mississippi	6, 921	5, 889	30, 716
La Gloria	Texas	5, 908	5, 748	32, 967
Caddo	Louisiana	4, 968	5, 740	189, 819
Coyote	California	6, 485	5, 711	228, 968
Paloma	do	6, 108	5, 677	30, 842
Talco	Texas	6, 168	5, 615	122, 437
Drinkard	New Mexico	6, 742	5, 538	22. 653

For footnotes, see end of table.

TABLE 12.—Production of crude petroleum in leading fields in the United States, 1949–50, and total production since discovery, in thousands of barrels—Con.

Field	State	1949	1950	Total since discovery [1]
West Ranch	Texas	5,058	5,463	64,834
Foster	do	6,013	5,447	63,776
Guijarral Hills	California	2,870	5,446	8,442
Katy	Texas	5,271	5,359	29,284
Old Ocean	do	5,117	5,305	59,406
Santa Fe Springs	California	5,340	5,288	533,500
Caillou Island	Louisiana	4,082	5,240	55,980
Tinsley	Mississippi	5,560	5,189	117,785
Weeks Island	Louisiana	2,870	5,154	10,644
Silica	Kansas	4,597	5,147	94,456
Golden Meadow	Louisiana	4,133	5,123	40,848
Erath	do	5,886	5,071	41,705
Elk City	Oklahoma	788	5,066	5,917

[1] Includes revisions.
[2] Bureau of Mines data.
[3] Slaughter includes Levelland for 1949.

CRUDE PRODUCTION BY STATES

Alabama.—Crude production in Alabama in 1950 increased 59.1 percent compared with 1949 and totaled 735,000 barrels, or 273,000 barrels more than the 1949 output (462,000 barrels). The first quarter of the year showed a slight gain over the last quarter of the previous year; the second quarter indicated a definite increase (27 percent), and this upward trend held throughout the remainder of the year.

Continued expansion of both the Selma chalk and Eutaw sand (Upper Cretaceous) producing areas in Gilbertown contributed to the increased production in 1950. Ninety-eight percent of the year's total output for Alabama was from the Gilbertown field; the remainder came from the newly discovered South Carlton field.

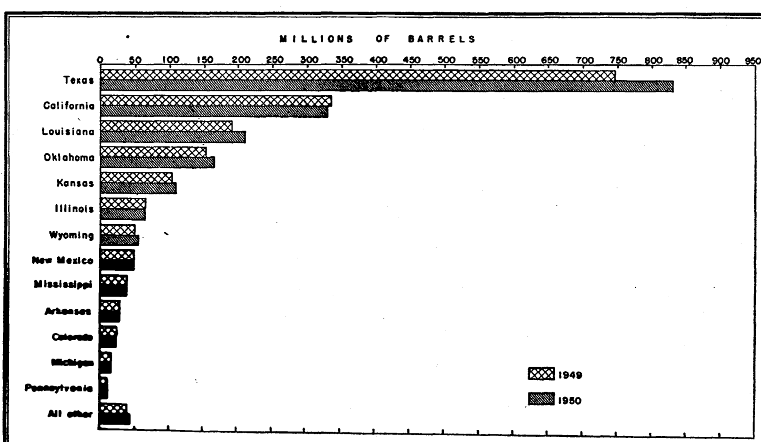

FIGURE 3.—Production of crude petroleum in the United States, 1949–50, by States.

Arkansas.—Crude production totaled 31,108 thousand barrels in 1950 compared with 29,986 thousand in 1949 and represented a gain of 1,122 thousand barrels or 3.7 percent for the year. With a slight rise in output for the first quarter compared with the previous one, a gradual upward trend developed in the second and third quarters, with a leveling off in the fourth period.

The Magnolia field, Columbia County, continued to lead all others, with the output for 1950 at 4,547 thousand barrels. The Smackover field was second, with 3,991 thousand barrels; the Wesson field gained third place, with 3,452 thousand barrels; and Schuler field dropped to fourth place, with 2,854 thousand barrels.

In all, 397 wells were drilled, a moderate gain over the previous year. A slight decline was noted in percentage of dry wells, with a distinct increase in the percentage of oil wells completed. Of the 104 exploratory wells, 84 were new-field wildcats, a slight decrease from the 88 new-field wildcats drilled in 1949.

Discoveries in Arkansas in 1950 consisted of eight new oil fields, four extensions, and three producing zones. Of the eight new oil fields discovered, only three were developed to any extent during the year—the Tubal and Catesville fields in Union County and the Bodcaw field in Nevada County. The first two may develop into large fields and add appreciably to reserves, while the third appears to be small and is expected to add very little.

There has been little activity in the Fort Lynn field since discovery owing to bad weather and unfavorable terrain. Indications in this fault-line discovery point to development of a good field and may result in increased exploration along the fault trend.

TABLE 13.—Production of crude petroleum in Arkansas, 1946–50, by fields

[Thousands of barrels]

Field	1946	1947	1948	1949	1950 [1]
Atlanta	1,578	1,472	1,383	1,080	999
Buckner	544	654	861	778	798
Dorcheat-Macedonia	1,446	1,503	1,263	930	983
Fouke	957	985	1,037	945	894
McKamie	1,062	1,175	1,084	1,156	1,179
Magnolia	4,718	4,648	4,622	4,292	4,547
Midway	2,646	2,703	2,851	2,685	2,786
Schuler	4,419	4,022	3,820	3,140	2,854
Smackover	4,092	3,983	3,901	3,900	3,991
Stephens	1,866	1,475	1,278	1,611	1,774
Village	1,230	1,791	2,086	1,850	1,677
Wesson	622	1,793	3,084	3,053	3,452
Other fields [2]	3,195	3,744	4,412	4,566	5,174
Total Arkansas	28,375	29,948	31,682	29,986	31,108

[1] Preliminary figures.
[2] Includes oil consumed on leases and net change in stocks held on leases for entire State.

California.—Petroleum production in California declined 5,315 thousand barrels from 332,942 thousand barrels in 1949 to 327,627 thousand barrels in 1950, a decrease of 1.6 percent. Adhering to the general trend in the industry for 1950, California crude-oil production decreased moderately during the first quarter of the year, recovered during the second period, and continued upward during the last half with the greatest quarterly percentage increase (6.1 percent) in the fourth quarter.

Although total crude production for 1950 decreased from the 1949 total, with corresponding decreases in the majority of producing areas, notable increases were made in some fields. These included the Raisin City and Russell Ranch-South Cuyama fields in the San Joaquin Valley district, the Aliso Canyon, San Miguelito, and Ventura-Newhall fields in the Coastal district, and the Long Beach and Wilmington fields in the Los Angeles Basin district. Of these, the greatest percentage increases were in the Russell Ranch-South Cuyama field, with 104.6 percent, and the Wilmington field, with 6.3 percent.

The 1,828 wells drilled in 1950 compared with 2,512 wells in 1949 represented a considerable decline in exploratory activity—27.2

TABLE 14.—Production of crude petroleum in California, 1946–50, by districts and fields, in thousands of barrels

[American Petroleum Institute]

District and field	1946	1947	1948	1949	1950 [1]
San Joaquin Valley:					
Belridge	5,862	4,488	4,019	2,920	2,931
Buena Vista	14,756	17,265	16,596	13,907	12,032
Coalinga	32,105	33,754	35,818	33,266	31,210
Coles Levee [2]	6,335	7,225	6,591	7,239	7,207
Edison	5,316	4,124	4,107	4,126	3,914
Elk Hills	3,668	2,334	2,118	3,057	2,700
Fruitvale	2,723	2,391	2,383	2,720	2,827
Greeley	3,923	4,288	5,100	4,750	4,061
Helm	1,580	1,553	1,264	979	819
Kern River-Kern Front	6,826	6,979	8,240	6,934	6,461
Kettleman North Dome	13,849	13,480	12,832	11,739	10,467
Lost Hills	1,315	1,922	2,750	2,383	2,019
McKittrick	5,409	9,941	10,606	6,509	5,774
Midway-Sunset	15,318	15,660	15,165	12,758	11,431
Mountain View	1,369	1,894	1,307	1,199	1,240
Mount Poso	5,930	5,151	4,567	4,216	3,809
Raisin City	988	962	1,093	1,356	1,613
Rio Bravo	4,883	4,576	4,430	4,229	3,748
Riverdale	1,481	1,546	1,155	966	780
Round Mountain	3,352	3,085	2,700	2,438	2,167
Russell Ranch-South Cuyama			842	8,066	16,504
Tejon Ranch	487	1,187	1,133	861	795
Ten Section	3,229	2,829	2,379	2,351	2,076
Other San Joaquin Valley	8,492	9,280	9,650	9,859	9,532
Total San Joaquin Valley	149,196	155,914	156,845	148,828	146,117
Coastal district:					
Aliso Canyon	1,098	1,219	1,226	1,275	1,455
Del Valle	2,355	3,069	3,516	3,283	1,261
Elwood	2,454	2,576	2,682	2,681	2,313
Gato Ridge	1,421	1,314	1,279	1,150	933
Newhall-Potrero	2,111	2,397	2,726	3,185	2,995
Padre Canyon	904	1,179	2,092	2,655	2,462
Rincon	1,627	1,344	1,158	1,264	1,304
San Miguelito	1,835	1,874	1,832	2,350	2,895
Santa Maria	4,921	7,938	10,276	7,369	7,074
Santa Maria Valley	11,929	9,518	7,269	5,667	4,509
Ventura Avenue	16,906	17,754	17,738	21,040	20,985
Ventura-Newhall	2,542	3,369	4,016	9,412	9,857
Other Coastal	2,419	2,580	3,590	3,746	4,786
Total Coastal	52,522	56,131	59,400	65,077	62,829
Los Angeles Basin:					
Brea Olinda	3,945	4,449	5,286	5,213	4,533
Coyote	7,315	7,277	7,381	6,450	5,717
Dominguez	5,875	5,436	4,818	4,743	4,602
Huntington Beach	17,084	18,291	20,821	21,035	20,568
Inglewood	4,720	4,330	4,420	5,064	4,879
Long Beach	9,055	8,596	8,159	8,349	8,432
Montebello	3,129	2,696	2,467	2,346	2,185
Newport	1,894	2,630	2,412	2,242	1,785
Richfield	2,595	2,413	2,272	2,347	2,364
Rosecrans	1,840	1,684	1,695	[3] 2,247	[3] 1,991
Santa Fe Springs	6,117	5,914	5,512	5,327	5,288
Seal Beach	3,693	4,042	4,150	4,381	4,286
Torrance	3,126	2,938	2,862	2,762	2,615
Wilmington	40,171	47,674	48,317	43,509	46,234
Other Los Angeles Basin	2,436	2,717	3,257	3,022	3,202
Total Los Angeles Basin	112,995	121,087	123,829	119,037	118,681
Total California	314,713	333,132	340,074	332,942	327,627

[1] Preliminary figures. [2] Includes Tupman. [3] Includes Athens.

percent. Adverse price and demand factors carried over from the latter part of 1949 into the first half of 1950. The Korean situation, however, caused a rapid rise in demand for Pacific coast crude oil. The increased price of crude also stimulated exploration. This effect of increased demand and price became apparent in the latter part of the year, when exploratory activity trended upward.

Colorado.—Total crude production for 1950 in Colorado decreased 1 percent to 23,353 thousand barrels from the 23,587 thousand barrels produced in the all-time record year 1949. In line with the general trend of the industry during the first three quarters of the year, production dropped moderately during the first quarter, gained slightly during the second period, increased appreciably in the third quarter, and reached an all-time quarterly high in the fourth period with an increment of 19.3 percent over the preceding quarter. The principal declines for the year were for the Rangely and Iles fields.

Highlight of exploration in 1950 was the rapid and successful development of the eastern flank of the Denver-Cheyenne Basin in northeastern Colorado and western Nebraska. Thirteen Cretaceous new-field discoveries were made in this basin. Announced plans for constructing a crude-oil line linking Wyoming, eastern Colorado, and western Nebraska areas with north midcontinent markets is expected to provide impetus for increased development activity in 1951.

TABLE 15.—Production of crude petroleum in Colorado, 1946–50, by fields

[Thousands of barrels]

Year	Fort Collins-Wellington	Hiawatha	Iles	Maudlin Gulch	Moffat	Price	Powder Wash	Rangely	Walden	Wilson Creek	Other fields [1]	Total
1946	135	45	441		93	239	24	8,128	188	2,381	182	11,856
1947	133	51	541		91	195	29	11,600	179	2,705	178	15,702
1948	127	62	534	1	112	164	35	13,881	129	2,602	215	17,862
1949	99	63	531	51	85	164	63	19,632	120	2,586	193	23,587
1950 [2]	115	64	503	174	81	181	91	19,006	115	2,796	227	23,353

[1] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.
[2] Preliminary figures.

Florida.—Crude production for 1950 in Florida increased substantially (10.4 percent)—from 441 thousand barrels in 1949 to 487 thousand. Opening the year with a slight increase for the first quarter compared with the preceding period, distinct gains were made in the second and third quarters, with a leveling off in the fourth period.

Only 9 wildcats were drilled in 1950, compared with 19 in 1949 and 24 in 1948. All but one of the 1950 wildcats were drilled in north Florida, the south Florida well being in Monroe County in the Florida Keys. Three field wells were drilled in the State's only field, Sunniland. One produced from the Glen Rose (Lower Cretaceous) at 11,535–11,567 feet, and the other two were dry. At the end of 1950 the Sunniland field had 11 pumping wells and one flowing well.

Illinois.—Crude production for Illinois in 1950 decreased 4.0 percent from the 1949 total of 64,501 thousand barrels (Bureau of Mines data) to 61,922 thousand barrels. The quarterly trend for the State corresponded generally with the trend for the industry as a whole, except for a marked decline of 2.8 percent during the last quarter.

Although total crude output for 1950 dropped below 1949, exploratory activity increased approximately 3.8 percent; 1,280 oil wells were drilled, 17 gas wells reported, and 1,511 dry holes recorded. Wildcat wells drilled in 1950 were 11 percent more numerous than in 1949, with those over 2 miles from production—"wildcats far"—4.3 percent successful. In 1949, 7 percent of the "wildcats far" were successful. Drilling activity was greatest in the deep-basin area of southeastern Illinois.

TABLE 16.—Production of crude petroleum in Illinois, 1946–50, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1946	1947	1948	1949	1950
Albion	898	663	595	979	1,187
Boyd	1,497	1,313	1,210	1,062	887
Bridgeport	2,272	2,267	1,905	1,943	2,012
Centralia	1,887	1,456	1,251	1,712	1,250
Clay City-Noble	7,192	5,833	8,585	8,347	8,142
Dale-Hoodville	1,479	1,341	1,323	1,300	1,187
East Inman	561	343	1,102	1,905	1,050
Johnsonville	1,206	936	1,173	941	829
Louden	8,243	7,385	6,715	6,077	7,436
Marine	1,208	1,057	1,080	988	872
New Harmony-Keensburg	3,529	3,217	2,918	2,783	2,376
Patoka	1,651	1,345	769	607	646
Phillipstown	1,038	829	1,032	861	829
Robinson	1,118	1,100	1,236	1,381	1,532
Roland	752	641	1,154	1,049	652
Rural Hill	510	786	1,020	819	1,105
Sailor Springs	418	688	1,320	2,371	1,833
Salem	5,967	5,239	4,706	4,106	3,726
Other fields	33,187	29,021	24,938	24,855	24,552
Total Illinois	74,613	65,460	64,032	64,086	62,103

Indiana.—Production of 9,942 thousand barrels of crude during 1950 reflected an increase of 2.5 percent over the 1949 total of 9,696 thousand barrels. Although a marked decline of approximately 17 percent occurred during the first quarter compared with the preceding period, a substantial recovery was made in the second quarter, with a leveling off in the third period and a slight decline in the fourth.

Exploratory activity increased substantially—approximately 20 percent over 1949—tests drilled totaling 1,533. However, drilling activity was more or less confined to the frontiers established in 1949, and geophysical work progressed on leases acquired during the previous year.

TABLE 17.—Production of crude petroleum in Indiana, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	482	504	599	605	611	577	578	568	545	580	519	558	6,726
1947	538	476	532	522	520	501	516	503	492	504	484	507	6,095
1948	504	476	528	520	547	550	570	577	635	679	663	725	6,974
1949	667	620	735	734	855	792	804	864	845	941	915	924	9,696
1950 [1]	732	728	848	832	857	831	869	881	840	889	816	819	9,942

[1] Preliminary figures.

Kansas.—A substantial gain in crude production in 1950 for Kansas was reported; output increased 5,718 thousand barrels or 5.6 percent over the 1949 total of 101,868 thousand barrels (Bureau of Mines data). The quarterly trend for the year coincided approximately with that for the industry as a whole, but with peak output in July.

Development and exploration drilling in Kansas attained its highest volume since 1918. Completions for 1950 totaled 3,950 compared with 3,356 for 1949 and increased approximately 17.7 percent. With this marked rise in exploratory drilling, the percentage of successes in 1950 varied only slightly from that in 1949.

The most notable advances in production by fields were made in Big Creek, Bloomer, Fairport, Kraft-Prusa, Ray, and Silica-Raymond. The most active counties with respect to drilling included Barton, with 527 completions; Russell, 374; Butler, 361; and Stafford, 316. Allowable oil production for prorated wells during the year was increased over the allowables set for 1949. In 1950 the allocation was set at 270,000 barrels per day for January, February, and March; it was increased to 275,000 for April, 285,000 for May, 295,000 for June, and 300,000 for July through December.

TABLE 18.—Production of crude petroleum in Kansas, 1946–50, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1946	1947	1948	1949	1950
Bemis-Shutts	5,305	6,057	5,748	4,560	4,681
Big Creek	764	751	836	766	1,038
Bloomer	2,749	3,045	3,161	2,492	2,716
Burnett	2,873	3,120	4,996	3,497	2,747
Burrton-Haury	1,209	1,073	1,024	1,211	1,127
Chase	2,766	2,644	2,583	3,258	3,078
El Dorado	2,618	2,764	3,026	3,084	3,019
Fairport	726	735	801	908	1,243
Geneseo-Edwards	3,220	3,733	3,519	2,803	2,960
Gorham	1,891	1,880	1,667	1,445	1,406
Hall-Gurney	3,455	3,414	3,485	3,433	3,159
Kraft-Prusa	5,257	6,425	6,871	5,463	5,870
Morel	1,098	1,641	1,717	1,399	1,337
Ray	1,213	1,397	1,390	1,246	1,484
Silica-Raymond	5,691	5,783	5,387	5,092	5,599
Stoltenberg	2,747	2,804	2,483	2,098	1,962
Trapp	11,042	11,371	10,404	8,905	8,645
Other fields	41,955	45,691	48,715	48,472	55,149
Total Kansas	96,579	104,328	107,813	100,132	107,220

Kentucky.—Accelerated drilling activity in Kentucky during 1950 caused a substantial gain in crude production. Output increased 1,498 thousand barrels to reach 10,301 thousand barrels in 1950, representing an advance of approximately 17.0 percent over the 1949 figure of 8,803 thousand barrels. Opening the year with a considerable decline during the first quarter compared with the preceding period, a gain of approximately 18.3 percent was made in the following quarter, with a continued upward trend for the last half of 1950.

Drilling activity in 1950 increased approximately 10 percent over the previous year, resulting in 516 oil wells, 157 gas wells, and 474 dry holes and giving 673 successful completions compared with 641 in 1949.

TABLE 19.—Production of crude petroleum in Kentucky, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	866	835	929	907	940	897	922	906	866	875	812	823	10,578
1947	800	679	774	787	781	752	814	777	803	842	772	816	9,397
1948	748	706	801	663	736	732	738	728	726	746	730	747	8,801
1949	711	628	743	699	739	688	722	723	755	806	799	790	8,803
1950 [1]	688	648	840	803	914	857	887	925	919	1,021	896	903	10,301

[1] Preliminary figures.

Louisiana.—Production of crude reached an all-time high for Louisiana in 1950, when output exceeded the previous annual record set in 1949. The State realized an increase of 18,290 thousand barrels in 1950 for a total of 209,116 thousand barrels, or a 9.6-percent increment over 1949. Production figures for 1950 indicated a moderate decline during the first quarter, followed by a slight decrease in the second. A marked increase occurred in the third quarter and an additional gain in the fourth. Gulf Coast area production increased 12.6 percent, while output for the rest of the State dropped less than 1 percent.

Fields in northern Louisiana showing increases in production during 1950 were Caddo, Haynesville, and Lisbon, whereas those showing considerable losses were Big Creek, Delhi, Lake St. John, and Ora. In the Louisiana Gulf Coast area, the fields making the greatest gains were Caillou Island, Golden Meadows, Venice, and Weeks Island.

For the Gulf Coast area, the success percentage of the total new-field wildcats was not as high as in 1949. The discovery rate of offshore wildcats was just slightly above the average for inland wildcats. At this time, the major discoveries appear to be Cox Bay, Eugene Island, Block 126, Glenmora, Phoenix, and Romere Pass.

TABLE 20.—Production of crude petroleum in Louisiana, 1946–50, by districts and fields

[Thousands of barrels]

District and field	1946	1947	1948	1949	1950 [1]
Gulf Coast:					
Anse la Butte	2,448	2,423	2,385	2,160	2,194
Avery Island	1,223	1,601	2,137	2,376	2,649
Barataria	1,523	1,932	3,255	3,468	3,450
Bay St. Elaine	380	817	1,495	2,055	2,230
Bayou Sale	3,479	4,445	5,221	4,996	4,737
Caillou Island	2,054	2,699	3,549	4,135	5,335
Charenton	1,200	1,580	1,514	1,512	1,361
David Haas	----------	27	662	1,084	1,170
Delta Farms	4,510	5,539	6,818	7,581	7,648
East White Lake	1,427	1,357	1,333	1,217	1,321
Egan	1,453	2,054	2,441	2,381	2,136
Erath	1,204	1,194	1,233	1,246	1,214
Garden Island	1,168	1,295	1,353	1,509	1,614
Gibson	2,555	2,161	2,089	1,717	1,539
Golden Meadows	2,400	2,666	3,493	4,156	5,020
Good Hope	1,745	2,178	2,351	2,177	2,240
Grand Bay	3,122	3,433	3,729	3,590	3,766
Gueydan	2,200	2,008	2,072	2,115	2,217
Hackberry	3,794	4,000	4,264	3,626	3,519
Horseshoe Bayou	413	677	878	1,178	1,246
Iowa	2,486	2,489	2,478	2,212	1,947
Jennings	2,025	1,809	1,492	1,207	1,104
Lafitte	4,374	4,362	4,107	4,017	4,332
Lake Chicot	922	1,349	1,201	1,083	1,031
Lake Pelto	1,302	1,429	1,558	1,584	1,625
Lake Salvador	1,632	1,623	1,665	1,842	1,972

For footnotes, see end of table.

TABLE 20.—Production of crude petroleum in Louisiana, 1946–50, by districts and fields—Continued

[Thousands of barrels]

District and field	1946	1947	1948	1949	1950 [1]
Gulf Coast—Continued					
Leeville	1,381	1,580	1,811	1,910	2,112
New Iberia	1,744	1,526	1,548	1,577	1,462
North Crowley	1,526	1,521	1,696	1,753	1,767
Paradis	3,688	3,728	3,936	3,698	3,649
Pine Prairie	1,821	1,546	1,409	1,416	1,168
Port Barre	1,103	1,375	1,636	1,456	1,470
Quarantine Bay	3,227	3,421	3,745	3,445	3,725
St. Gabriel	1,741	1,786	1,709	1,629	1,577
Section 28	230	364	518	1,103	1,296
Tepetate	2,936	3,402	3,935	3,977	3,788
University	1,884	1,976	2,097	2,844	2,840
Venice	3,030	3,638	4,174	4,614	5,001
Ville Platte	2,588	2,238	2,106	1,969	1,888
Vinton	3,372	3,654	3,578	3,740	3,872
Weeks Island	206	678	1,642	2,922	5,183
West Bay	1,246	1,691	2,108	2,281	2,404
West Cote Blanche	971	1,040	1,280	1,827	1,704
West Lake Verrett	1,136	1,357	1,379	1,393	1,472
White Castle	1,013	1,229	1,597	1,594	1,692
Other Gulf Coast [2]	26,923	28,811	31,313	35,061	48,189
Total Gulf Coast	112,805	123,708	137,990	146,433	164,876
Northern:					
Big Creek	908	1,892	1,963	1,664	1,443
Caddo	1,944	2,328	3,392	4,969	5,689
Delhi	5,525	8,041	8,576	7,545	6,733
Haynesville	3,321	3,500	4,405	5,339	5,444
Holly Ridge	1,254	1,162	1,025	960	794
Lake St. John	4,381	5,544	7,357	7,300	6,695
Lisbon	467	653	978	1,703	2,216
Nebo [3]	2,805	2,798	2,623	2,438	2,328
Olla [4]	3,109	2,921	2,794	2,625	2,490
Ora		674	2,997	1,896	1,085
Rodessa	1,978	1,727	1,509	1,302	1,186
Other Northern [2]	5,172	5,180	5,849	6,652	8,137
Total Northern	30,864	36,420	43,468	44,393	44,240
Total Louisiana	143,669	160,128	181,458	190,826	209,116

[1] Preliminary figures.
[2] Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
[3] Includes Hemphill, Trout Creek, and Jena.
[4] Includes Little Creek and Summerville.

Michigan.—Crude production for 1950 in Michigan declined 4.3 percent, or 706 thousand barrels, from the 1949 total of 16,517 thousand barrels. Except for a slight gain in the second quarter over the preceding period in 1950, quarterly declines were noted for the remainder of the year.

Although a general increase in activity had been noted for the past several years, decreased exploratory and development drilling was evident in 1950. In all, 837 wells were drilled compared with 925 wells in the previous year, a decline of 9.5 percent. In general, there was a moderate decline in oil and gas production in 1950, a curtailment of development drilling, a slight increase in exploratory drilling, and a great increase in geological testing.

TABLE 21.—Production of crude petroleum in Michigan, 1946–50, by fields, in thousands of barrels

[Michigan Department of Conservation]

Year	Beaver Creek	Cold-water	Deep River	East Nor-wich	Kaw-kaw-lin	Kim-ball Lake	Pent-water	Porter	Reed City	Stony Lake	Other fields	Total
1946	--------	1,598	2,409	439	697	--------	--------	462	3,250	3	8,216	17,074
1947	15	1,746	2,872	358	725	868	--------	412	2,209	419	6,591	16,215
1948	370	2,212	2,885	336	804	1,614	392	381	1,282	849	5,746	16,871
1949	904	1,673	2,396	322	755	1,119	1,333	354	944	861	5,856	16,517
1950 [1]	794	1,635	2,080	331	722	847	1,410	429	752	998	5,813	15,811

[1] Preliminary figures.

Mississippi.—Petroleum production for 1950 increased 0.8 percent above the 1949 output of 37,966 thousand barrels to 38,258 thousand barrels. There was a moderate decline in the first quarter of 1950 compared with the last quarter of 1949 but a notable increase of approximately 6.0 percent in the second period, followed by a like increment in the third quarter and a moderate decrease in the fourth.

Exploratory activity declined in 1950, with 313 wells drilled contrasted with 333 in 1949. Of these 124 were oil producers, 9 gas producers, and 180 dry holes.

TABLE 22.—Production of crude petroleum in Mississippi, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	1,697	1,554	1,663	1,707	1,918	1,921	1,981	2,220	2,207	2,384	2,425	2,621	24,298
1947	2,720	2,352	2,655	2,613	2,829	2,832	2,976	3,073	3,082	3,326	3,158	3,309	34,925
1948	3,526	3,419	3,702	3,652	3,817	3,760	4,027	4,021	3,856	4,069	3,956	3,956	45,761
1949	3,580	3,028	3,383	3,286	3,376	2,990	3,073	3,124	2,990	3,069	3,017	3,050	37,966
1950 [1]	3,029	2,753	3,119	2,938	3,194	3,304	3,388	3,406	3,293	3,371	3,232	3,231	38,258

[1] Preliminary figures.

Montana.—Crude production for Montana declined considerably in 1950, with total output dropping approximately 11 percent from 9,118 thousand barrels in 1949 to 8,112 thousand. The quarterly trend for the State in 1950 coincided generally with that for the industry as a whole.

Two new-field wildcats were successful in the West and Northwest Sumatra area. Little exploratory activity was evident in Montana during 1950, as outpost and field drilling highlighted the year's activity.

TABLE 23.—Production of crude petroleum in Montana, 1946–50, by fields, in thousands of barrels

[Montana Oil Conservation Board]

Year	Big Wall	Cat Creek	Cut Bank	Dry Creek	Elk Basin	Kevin-Sun-burst	Mel-stone	Pon-dera	Rea-gan	Other fields [1]	Total
1946	--------	480	4,546	160	1,355	1,772	--------	306	--------	206	8,825
1947	--------	586	4,246	130	1,728	1,625	--------	317	10	100	8,742
1948	2	510	4,074	105	2,415	1,623	14	361	61	217	9,382
1949	225	459	3,437	109	2,331	1,559	70	515	226	187	9,118
1950 [2]	460	398	2,930	95	1,569	1,488	164	544	182	282	8,112

[1] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.
[2] Preliminary figures.

Nebraska.—The year 1950 marked the debut of Nebraska as a substantial full-scale oil-producing area, with output increasing 369 percent, or 1,217 thousand barrels, over the 1949 production of 330 thousand barrels to reach an all-time record. Production increased in each quarter of the year.

Principal exploration activity in the State occurred in the Denver-Cheyenne Basin of western Nebraska, in which six Cretaceous new-field discoveries were made. With five successful outpost wells in 1950, the Huntsman field promises to develop into a comparatively large reserve.

TABLE 24.—Production of crude petroleum in Nebraska, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	28	22	25	27	29	26	27	26	22	23	20	18	293
1947	23	18	18	17	17	18	19	17	21	20	20	21	229
1948	17	14	18	17	18	20	21	20	16	18	17	19	215
1949	21	18	20	20	17	18	28	23	25	49	41	50	330
1950 [1]	56	54	64	72	84	96	154	105	171	227	215	249	1,547

[1] Preliminary figures.

New Mexico.—Crude production in New Mexico attained an all-time record in 1950, when output, according to Bureau of Mines data, passed the 48-million-barrel mark. There were successive increases in each quarter of the year, except for a moderate decline in the first quarter compared with the last quarter of 1949.

As in the previous year, the major producing fields were as follows: Drinkard, Monument, Vacuum, Eunice, Hobbs, Brunson, and Maljamar. Drilling was most active in the San Juan Basin in San Juan and Rio Arriba Counties of northwestern New Mexico and in Chaves and Lea Counties of the southeastern area of the State.

TABLE 25.—Production of crude petroleum in Mew Mexico, 1946–50, by districts and fields, in thousands of barrels

[Oil and Gas Journal]

District and field	1946	1947	1948	1949	1950
Southeast:					
Arrowhead	1,691	1,547	1,460	1,289	1,059
Brunson	(1)	1,360	2,660	3,015	2,143
Drinkard	650	3,332	6,236	6,742	5,538
Eunice	6,007	5,796	5,360	4,414	3,898
Grayburg-Jackson	1,811	1,935	1,869	1,763	1,750
Hobbs	3,569	3,562	3,841	3,732	3,924
Langlie-Mattix	1,196	1,122	1,075	1,126	1,546
Maljamar	2,033	2,119	2,033	2,042	2,011
Monument	6,565	6,541	6,902	6,488	6,168
Paddock	655	1,298	1,584	1,568	1,378
Vacuum	4,054	4,099	4,504	4,449	4,546
Other	8,023	7,854	9,708	10,714	12,787
Northwest [2]	450	405	375	335	567
Total New Mexico	36,704	40,970	47,607	47,677	47,315

[1] Included with "Other."
[2] Bureau of Mines data.

New York.—Crude production in New York declined moderately in 1950, output dropping 282 thousand barrels, or 6.4 percent, below the 1949 total to 4,143 thousand barrels.

Development activity was minor and limited to work in small areas by local companies. There was little geological and no geophysical work with respect to oil and gas during the year. New York State is likely to be dormant as an exploratory area until the large Pennsylvania play and the drilling of untested Pennsylvania structures have diminished.

TABLE 26.—Production of crude petroleum in New York, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	418	370	398	416	424	405	404	416	397	428	383	404	4,863
1947	419	349	384	395	400	400	424	393	402	416	359	421	4,762
1948	375	351	410	387	386	397	396	390	389	368	386	386	4,621
1949	371	362	392	371	363	373	362	388	366	361	350	366	4,425
1950 [1]	365	305	362	320	372	351	338	362	341	354	331	342	4,143

[1] Preliminary figures.

Ohio.—Production of crude in Ohio decreased moderately during 1950, by 150 thousand barrels, or 4.3 percent from the 1949 output of 3,483 thousand barrels. Adhering to the over-all trend for the industry in 1950, successive quarterly figures showed a moderate decline for the first period, followed by an appreciable gain in the second, an additional increment in the third, and a leveling off in the fourth.

No important oil or gas fields were discovered in 1950, although drilling activity in the oil-producing counties increased as a result of advances in crude prices and a considerable lack of gas discoveries.

TABLE 27.—Production of crude petroleum in Ohio, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	234	214	242	248	260	245	238	243	242	260	235	247	2,908
1947	236	201	244	266	256	264	282	259	274	291	250	285	3,108
1948	259	251	309	302	303	312	317	324	309	305	298	311	3,600
1949	263	267	304	287	288	321	281	315	293	293	288	283	3,483
1950 [1]	282	250	292	264	290	305	288	310	272	303	228	249	3,333

[1] Preliminary figures.

Oklahoma.—Crude production in Oklahoma during 1950 scored a substantial increase of approximately 8.7 percent over 1949 with output for the year reaching 164,899 thousand barrels (Bureau of Mines data) contrasted with 151,660 thousand barrels in the previous year. Although a considerable decline was noted for the first period of 1950 compared with the closing 3 months of 1949, consistent and substantial gains were made in each of the succeeding quarters.

Wildcat drilling increased during 1950, with a resulting rise in discoveries. One major discovery, North Milroy in Stephens County, added significantly to crude reserves, while increased development drilling provided numerous revisions and extensions of older fields.

Important additions to reserves in Oklahoma may be expected from development on a major scale in 1950 of secondary-recovery techniques, such as water flooding and gas repressuring of old fields. The majority of such operations were in the northeast quarter of the State, although other like projects were established in Caddo, Carter, Cotton, and Garvin Counties.

Much of Oklahoma has reached the saturation point of coverage by ordinary exploratory methods, and greater use of new seismic methods, such as air shooting, is expected in 1951.

TABLE 28.—Production of crude petroleum in Oklahoma, 1946–50, by fields, in thousands of barrels

[Oil and Gas Journal]

Field	1946	1947	1948	1949	1950
Allen	1,120	1,075	1,129	1,317	1,359
Apache	1,591	1,803	2,181	1,749	1,337
Beebe	661	619	601	740	1,272
Brock-west	----------	239	536	858	1,114
Burbank	2,927	2,615	2,432	2,338	2,124
Cache Creek	668	2,328	1,945	1,780	1,511
Cement	4,801	4,442	4,552	4,207	4,091
Coon Creek	561	1,652	1,731	1,539	1,363
Cumberland	3,696	3,948	3,955	3,275	3,628
Cushing	2,792	2,839	2,862	2,726	2,759
Edmond	583	545	470	434	392
Elk City	----------	----------	63	788	5,066
Fitts	1,518	1,287	1,141	1,076	1,026
Glenn	2,418	2,568	2,610	2,587	2,551
Healdton	2,438	2,431	2,629	2,527	2,382
Hewitt	1,698	1,672	1,633	[2] 2,716	4,320
Hoover-northwest	447	439	434	766	1,034
Knox	(1)	522	1,758	2,250	1,886
Lone Grove	388	1,497	1,199	1,023	834
Lucien	803	694	625	589	670
Oklahoma City	10,693	9,670	8,543	7,703	6,785
Pauls Valley	2,971	2,399	2,162	1,488	1,091
Ramsey	799	839	689	712	767
Ringwood	9	20	87	260	1,927
Seminole district:					
Bowlegs	1,169	1,172	1,262	1,176	1,201
Little River	1,159	1,432	1,416	1,194	1,016
St. Louis	[3] 1,500	1,356	1,330	1,283	1,405
Seminole City	1,307	1,271	1,086	1,441	1,164
Sholem Alechem	708	723	5,196	6,497	8,545
South Burbank	1,886	1,455	1,076	901	860
Tatums	548	638	1,119	3,795	3,456
Velma	2,457	8,153	12,225	10,134	10,227
West Edmond	23,565	14,936	9,222	5,478	3,914
Witcher	----------	30	1,497	2,094	1,942
Other fields	59,347	64,785	72,184	70,562	78,824
Total Oklahoma	137,228	142,094	154,680	150,003	163,843

[1] Included with "Other fields."
[2] Includes Bayou.
[3] Includes Pearson.

Pennsylvania.—A moderate increase in output of crude was attained in 1950 by Pennsylvania, with a differential of 438 thousand barrels, or 3.9 percent, above the 1949 total of 11,374 thousand barrels. Consecutive quarterly figures for 1950 indicate a gradual upward trend for the first 9 months and a leveling off in the closing period. A postwar monthly low in production was noted in February 1950.

The Bradford-Allegany field supplied 79 percent of Pennsylvania's oil production during 1950. Exploratory drilling in the shallow-sand territory of western Pennsylvania led to discovery of only one small new gas field. No new oil pool was discovered.

TABLE 29.—Production of crude petroleum in Pennsylvania, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	1,074	956	1,066	1,120	1,134	1,092	1,049	1,132	1,082	1,160	1,056	1,075	12,996
1947	1,110	920	1,017	1,069	1,081	1,057	1,110	1,056	1,072	1,120	994	1,084	12,690
1948	1,021	961	1,115	1,089	1,071	1,093	1,083	1,073	1,048	1,047	1,046	1,020	12,667
1949	983	916	1,029	970	956	959	919	980	922	940	884	916	11,374
1950 [1]	954	846	971	925	1,024	1,022	1,005	1,069	1,011	1,067	961	957	11,812

[1] Preliminary figures.

Tennessee.—Oil production for 1950 in Tennessee showed a moderate gain of 2 thousand barrels above the previous year's output of 18 thousand barrels; over 80 percent came from Morgan and Scott Counties in the northern part of the Cumberland Plateau. Production there is from middle and upper Mississippian limestones, which lie 700 to 1,500 feet below the surface. The remaining production was from Clay, Fentress, and Pickett Counties.

Although activity was high in the early and closing quarters of 1950, a midyear lull in exploration resulted in an unusually small number of completions and a low figure for footage drilled.

Texas.—Production of crude in 1950 in Texas increased 84 million barrels above that in 1949 to reach a total of 829 million barrels, an increment of approximately 11.3 percent. All districts except the Panhandle reported substantial gains in crude production over the previous year's output. The magnitude of the decrease in the Panhandle district was negligible in itself but significant in relation to the increases in other districts of the State. Percentage gains in 1950 over 1949 were: Gulf Coast 4.5 percent, West Texas 25.5 percent, East Texas 2.0 percent, and rest of the State 6.6 percent. These may be compared with a Nation-wide gain of 7.1 percent. Since Texas produced 42 percent of the Nation's crude oil, both annual and quarterly trends in Texas were reflected strongly in the figures for the industry as a whole. Despite the high crude output for the State in 1950, a postwar monthly low was noted for February.

Drilling activity increased and was maintained at a high rate during 1950, 16,509 wells being drilled in contrast with 13,619 in 1949, an increment of 21.2 percent. The percentage of successes varied only slightly from that of 1949.

Gulf Coast.—A gain of about 9 million barrels in crude production was reported for the Gulf Coast district in 1950, or 4.5 percent above the previous year. Fields reporting large increases were Chocolate Bayou, Dickinson-Gillock, High Island, Hull, Markham, Old Ocean, and Sour Lake. The district reported 2,303 wells drilled during the year compared with 1,980 wells the previous year, a 16.3-percent increase. The percentage of successes in 1950 was slightly higher than for the previous year. Of the 1950 discoveries, none were of major importance, and several appeared to be marginal.

East Texas.—Crude production increased 2.0 percent in East Texas proper during 1950 compared with the previous year; output exceeded 144 million barrels. Drilling activity increased slightly during the year compared with 1949; 1,152 wells were drilled, of which 801 were oil producers, 51 gas producers, and 300 dry holes. Although several new moderate-size fields were discovered, none can be considered a major discovery.

Central Texas.—Crude production in Central Texas totaled 9,719 thousand barrels during 1950 compared with 8,892 thousand barrels for 1949, an increase of 9.3 percent. The principal producing fields were Charlotte, Darst Creek, and Luling; gains were reported for each during 1950.

North Texas.—Production of crude in North Texas increased over 10 million barrels, or 15 percent, to reach almost 80 million barrels for 1950. Exploratory activity continued high; leasing activity was greatest in the extreme western and eastern sections of this district. The total number of wells drilled exceeded any previous year and was expected to remain high as long as favorable conditions continued, that is, improvement of drilling techniques, and increased demand and higher price for crude.

Panhandle.—Crude production remained almost the same as in 1949, decreasing only slightly during 1950 compared with the previous year. A little over 33 million barrels of crude was produced in 1949 and 1950, although demand for Texas oil was considerably higher in the latter year.

Drilling activities in the Texas Panhandle continued to increase over preceding years, and leasing activity remained high, with major attention given the Palo Duro Basin.

South Texas.—A moderate gain in crude production, 4.6 percent, was reported for South Texas in 1950. Output totaled 76,916 thousand barrels, or more than 3 million above 1949. Development activity increased slightly compared with like operations during the preceding year. A decline in the rate of exploratory drilling was offset by the increased development in proved areas. Of continuing importance are the intensive development and utilization of casinghead gas and free gas in the production of light hydrocarbons.

West Texas.—Production of crude soared to more than 286 million barrels during 1950 as West Texas scored the greatest percentage annual gain in output of any district in the State. The most notable increase was attained in Scurry County, where production rose to 36.5 million barrels from approximately 6 million in 1949. Exploratory activity increased tremendously, including significant new-field wildcat successes. Development activity likewise rose considerably, providing continual extension of proved fields. It was anticipated that these development and exploratory trends would continue during 1951.

TABLE 30.—Production of crude petroleum in Texas, 1946–50, by districts and fields

[Thousands of barrels]

District and field [1]	1946	1947	1948	1949	1950 [2]
Gulf Coast:					
Amelia	1,493	1,581	1,581	1,080	715
Anahuac	10,137	10,663	10,832	7,103	6,801
Barbers Hill	1,853	1,969	1,944	1,964	2,110
Bay City	1,420	1,546	1,903	1,044	1,010
Bloomington	----------	249	1,337	1,794	1,745
Bonnie View	811	1,178	1,299	856	832
Chocolate Bayou	1,064	1,613	2,863	3,529	4,272
Conroe	20,708	21,950	20,519	11,638	11,993
Dickinson-Gillock	2,077	2,000	2,287	2,368	3,493
Dyersdale	859	953	1,171	1,393	1,580
Fairbanks	2,287	2,232	2,272	1,905	1,936
Falls City	1,170	1,509	1,571	1,048	1,101
Fannette	3,337	2,770	2,484	1,529	1,425
Fig Ridge	2,614	1,800	1,236	860	783
Friendswood	18,781	20,997	20,745	13,178	11,226
Greta	3,448	4,028	4,338	3,053	2,858
Hastings	19,317	21,279	21,643	14,317	13,247
Heyser	2,283	1,984	1,891	1,109	1,288
High Island	971	1,136	1,315	1,893	2,380
Hull	1,231	1,286	1,520	1,781	3,534
Humble	776	762	1,138	1,272	1,207
La Rosa	1,340	1,374	1,052	812	716
Livingston	1,712	1,895	1,898	1,353	1,373
Lolita	2,307	2,229	2,193	1,482	1,502
Lovell's Lake	1,806	1,556	1,595	1,113	1,220
Manvel	2,635	2,725	2,913	2,108	2,011
Markham	1,984	1,783	1,468	1,047	1,639
Old Ocean	6,088	5,473	5,983	5,096	5,521
Oyster Bayou	2,061	2,936	4,218	2,913	2,418
Pierce Junction	386	531	840	1,285	1,444
Placedo	2,177	2,222	2,281	1,675	1,974
Raccoon Bend	2,834	2,722	2,492	1,785	1,657
Refugio	2,418	3,203	3,119	2,355	2,522
Segno	1,282	1,276	1,161	850	772
Silsbee	1,137	1,064	1,114	1,176	1,253
Sour Lake	748	969	1,180	1,400	1,883
South Houston	1,558	1,592	1,641	1,417	1,193
Stowell	4,924	4,590	3,762	2,645	2,388
Sugarland	1,721	1,691	1,859	1,186	1,059
Sugar Valley	276	1,479	2,421	2,079	2,056
Thompsons	13,136	15,621	16,927	11,763	10,187
Tomball	3,711	3,388	3,518	2,394	2,212
West Columbia	2,314	2,394	2,591	2,654	2,619
West Ranch	7,116	7,043	7,031	5,066	5,456
Withers-Magnet	6,847	5,655	5,850	4,160	4,071
Other Gulf Coast [3]	49,536	55,643	64,637	55,064	63,457
Total Gulf Coast	218,691	234,539	249,633	189,592	198,139
East Texas:					
East Texas proper	120,789	117,112	112,284	93,951	98,225
Cayuga	2,456	2,285	2,098	1,991	1,768
Hawkins	14,914	17,045	17,609	11,464	10,439
Long Lake	2,072	2,122	2,223	1,491	1,649
Merigale	333	687	1,614	1,036	1,258
New Hope	1,284	1,481	1,617	1,894	1,836
Quitman	2,331	2,933	3,715	2,886	2,740
Rodessa	1,333	1,179	1,204	1,005	898
Mexia-Powell	1,144	1,124	1,038	977	1,030
Sulphur Bluff	1,247	1,175	1,167	735	827
Talco	8,755	8,849	8,804	6,188	5,871
Van	10,625	10,443	12,110	8,313	7,358
Other East Texas	6,676	7,762	8,899	9,686	10,602
Total East Texas	173,959	174,197	174,382	141,617	144,501
Central Texas:					
Charlotte	166	582	1,879	2,045	2,223
Darst Creek	2,595	2,541	2,574	2,508	2,554
Luling	1,321	1,455	1,401	1,387	1,578
Other Central Texas	2,431	3,061	3,345	2,952	3,364
Total Central Texas	6,513	7,639	9,199	8,892	9,719
North Texas [4] [5]	57,426	62,093	70,257	69,543	79,998
Panhandle [6]	29,716	29,589	31,725	33,076	33,056
South Texas:					
Agua Dulce	3,786	4,227	4,097	2,082	2,074
Hoffman	817	791	1,052	1,049	1,069
Kelsey	1,417	2,085	2,629	2,056	2,284

For footnotes, see end of table.

TABLE 30.—Production of crude petroleum in Texas, 1946–50, by districts and fields—Continued

[Thousands of barrels]

District and field [1]	1946	1947	1948	1949	1950 [2]
South Texas—Continued					
Midway	1,109	1,597	1,663	1,449	1,452
Saxet-Saxet Frio	2,498	2,595	2,519	1,794	1,819
Stratton	3,604	4,344	4,625	3,233	3,170
Taft	860	1,032	1,381	1,148	1,131
White Point	3,849	4,563	4,496	2,684	2,854
Other South Texas	63,949	68,419	71,809	58,059	61,063
Total South Texas	81,889	89,653	94,271	73,554	76,916
West Texas:					
Andrews	18,641	22,781	31,417	28,043	3,186
Crane-Upton	18,266	20,339	21,875	19,345	22,973
Coke		160	1,056	1,971	3,852
Crockett	3,794	7,050	8,496	6,931	7,078
Dawson	974	1,210	1,550	1,112	1,534
Ector [7]	38,532	50,392	67,518	53,814	57,096
Gaines-Yoakum	30,726	35,915	41,417	29,098	28,703
Garza	1,215	1,631	2,586	2,605	3,364
Glasscock-Howard-Mitchell-Scurry	7,704	8,276	9,002	12,455	8,977
Hockley	21,444	19,950	29,697	26,503	27,597
King	578	1,138	1,088	759	863
Pecos	17,457	20,122	22,771	17,036	17,862
Reagan	2,808	2,798	2,669	2,389	2,372
Ward	6,750	6,631	6,739	4,833	5,380
Winkler	22,410	22,626	24,325	18,506	17,961
Other West Texas	722	1,481	1,825	3,160	78,104
Total West Texas	192,021	222,500	274,031	228,560	286,902
Total Texas	760,215	820,210	903,498	744,834	829,231

[1] The breakdown of Texas districts, 1946–50, has been changed to agree with the Texas Railroad Commission divisions.
[2] Preliminary figures.
[3] Includes crude oil consumed on leases and net change in stocks held on leases for entire district.
[4] Includes the fields in and between Hardeman, Wilbarger, Wichita, Clay, Montague, and Cook Counties on the north and San Saba, Lampasas, and Coryell on the south.
[5] Includes crude oil consumed on leases and net change in stocks held on leases for East (exclusive of East Texas proper), Central, North, and South Texas.
[6] Carson, Gray, Hutchinson, Moore, Sherman, and Wheeler Counties.
[7] Includes the part of Jordan pool in Crane County.

Utah.—The production of 1,208 thousand barrels of crude in 1950 was an increase of 90 percent above the 637 thousand barrels produced in 1949. Quarterly figures for the year evidenced a trend in general conformity with that for the industry as a whole, that of consistently rising crude production.

During the year 1950, Carter and Stanolind confirmed their 1949 Uinta Basin strike with a half-mile step-out success. Accelerated interest in this area was expected in 1951.

Virginia.—Crude production for 1950 in Virginia declined 23 thousand barrels from the 1949 total of 43 thousand barrels, and represented a decrease of 53.5 percent. The quarterly trend in 1950 indicated a generally declining level of oil production despite increased development activity, particularly in the western portion of the State.

West Virginia.—Production of crude decreased 1.8 percent during 1950 in West Virginia; output dropped 51 thousand barrels below the 1949 total to 2,788 thousand barrels. Quarterly figures for 1950 indicate a downward trend, except for a moderate gain in the second quarter.

Development activity in general increased moderately during 1950 compared with 1949. Total completions were 652 as against 518 in 1949. Jackson County, with 81 completions, topped the list of completions by counties, followed by Pleasants with 75, Ritchie with

52, Wood with 49, Calhoun with 47, Wayne with 43, and Lincoln and Putnam with 34 each. These eight counties represented 57 percent of the completions.

TABLE 31.—Production of crude petroleum in West Virginia, 1946–50, by months

[Thousands of barrels]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1946	254	225	250	256	259	259	208	274	235	258	225	226	2,929
1947	227	183	220	202	211	209	218	219	229	253	208	238	2,617
1948	210	199	234	230	222	224	230	231	225	230	232	225	2,692
1949	212	209	233	226	235	238	236	254	247	260	247	242	2,839
1950 [1]	240	220	246	234	245	238	230	249	232	248	194	212	2,788

[1] Preliminary figures.

Wyoming.—An all-time crude-production record was established during 1950 in Wyoming; output increased 12.6 million barrels above 1949 to reach a high exceeding 60 million barrels, representing an increment of 26.2 percent. Successive gains were made in each quarter of the year. This development contrasted sharply with the downward trend in the early part of 1949 and was due to increased demand for black oil and rapid development of new reserves, particularly in the Sussex-Meadow Creek area.

TABLE 32.—Production of crude petroleum in Wyoming, 1946–50, by fields

[Thousands of barrels]

Year	Big Sand Draw	Byron-Garland	Cole Creek	Elk Basin	Fiddler Creek	Frannie	Grass Creek	Hamilton Dome	Lance Creek	Little Buffalo
1946	447	3,814	499	4,580	--------	1,331	1,094	1,396	4,920	574
1947	1,462	4,653	490	4,696	--------	1,711	1,042	2,196	4,294	982
1948	2,590	4,546	570	6,039	12	1,746	1,137	3,138	3,290	1,264
1949	2,250	2,628	515	5,325	1,246	1,305	899	1,493	2,862	598
1950	2,077	4,849	837	5,583	3,696	2,968	1,317	3,531	2,669	1,285

Year	Lost Soldier-Wertz, etc.	Mush Creek	Oregon Basin	Salt Creek	Steamboat Butte	Sussex	Winkleman	Worland	Other fields [1]	Total
1946	3,183	--------	4,164	4,642	1,888	--------	385	--------	6,060	38,977
1947	4,003	179	4,009	4,566	2,800	--------	507	313	6,869	44,772
1948	5,466	1,020	3,491	4,655	3,822	25	796	1,577	9,848	55,032
1949	5,322	1,085	1,604	3,937	2,247	262	471	3,076	10,765	47,890
1950	5,362	934	2,839	4,165	2,410	2,010	828	2,173	[2] 10,924	[2] 60,457

[1] Includes crude oil consumed on leases and net change in stocks held on leases for entire State.
[2] Preliminary figures.

WELLS

The number of wells drilled in the United States, including oil and gas wells and dry holes, set a new record, increasing from 37,656 in 1949 to 42,030 in 1950. The 4,374-well gain, compared with the small increase of 148 from 1948 to 1949, reflects the substantial increase in the demand for domestic crude oil in 1950 compared with the sharp decline in demand in 1949.

Oil-well completions increased from 22,042 in 1949 to 24,430 in 1950, and the number of gas wells declined from 2,887 to 2,843. The number of dry holes rose from 12,727 in 1949 to 14,757 in 1950, increasing from 33.8 percent of the total wells drilled in 1949 to 35.1 percent in 1950.

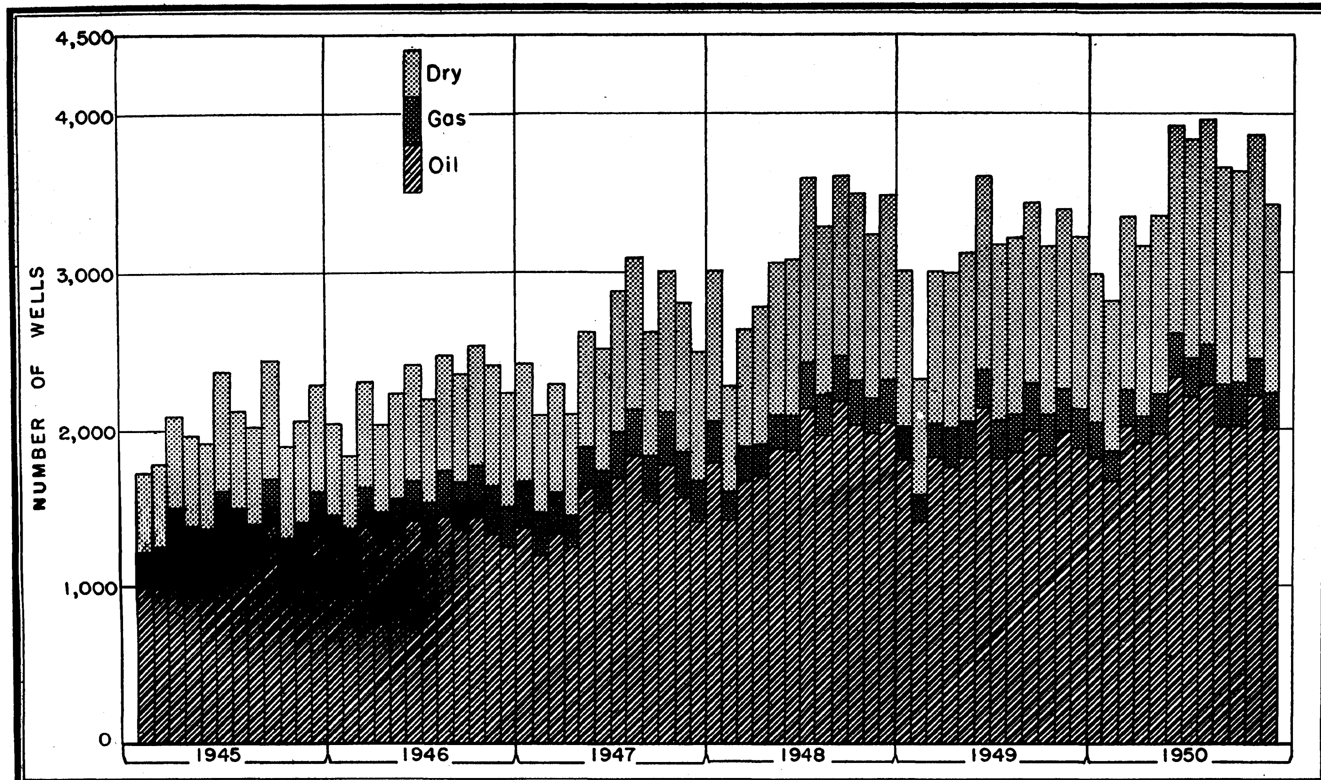

FIGURE 4.—Wells drilled in the United States, 1945–50, by months.

Principal gains from 1949 to 1950 in the total number of wells drilled were 2,890 in Texas, 1,057 in Oklahoma, 594 in Kansas, and 257 in Indiana. The largest declines were 684 in California, 237 in the Appalachian States, and 88 in Michigan.

TABLE 33.—Wells drilled for oil and gas in continental United States, 1949–50, by months

[Oil and Gas Journal]

Wells	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
													Number	Percent
1949														
Oil	1,804	1,414	1,816	1,753	1,805	2,133	1,803	1,847	1,984	1,826	1,980	1,877	22,042	58.5
Gas	204	172	212	246	238	240	253	245	298	261	264	254	2,887	7.7
Dry	1,006	742	976	987	1,072	1,230	1,117	1,129	1,156	1,075	1,146	1,091	12,727	33.8
Total	3,014	2,328	3,004	2,986	3,115	3,603	3,173	3,221	3,438	3,162	3,390	3,222	37,656	100.0
1950														
Oil	1,808	1,664	2,017	1,896	1,974	2,334	2,200	2,276	2,023	2,019	2,211	2,008	24,430	58.1
Gas	227	187	229	174	252	282	240	262	258	275	230	227	2,843	6.8
Dry	951	954	1,113	1,087	1,136	1,324	1,397	1,436	1,379	1,347	1,435	1,198	14,757	35.1
Total	2,986	2,805	3,359	3,157	3,362	3,940	3,837	3,974	3,660	3,641	3,876	3,433	42,030	100.0

TABLE 34.—Wells drilled for oil and gas in the United States, 1949–50, by States and districts

[Oil and Gas Journal]

State and district	1949				1950			
	Oil	Gas	Dry	Total	Oil	Gas	Dry	Total
Alabama	4		15	19	18	1	24	43
Arkansas	171	3	147	321	242	2	153	397
California	1,914	40	558	2,512	1,278	51	499	1,828
Colorado	21	4	57	82	22	12	65	99
Illinois	1,392	6	1,308	2,706	1,280	17	1,511	2,808
Indiana	521	30	725	1,276	576	51	906	1,533
Kansas	1,683	419	1,254	3,356	1,985	400	1,565	3,950
Kentucky	448	193	402	1,043	516	157	474	1,147
Louisiana:								
Gulf Coast	597	19	307	923	720	42	362	1,124
Northern	927	192	325	1,444	773	154	396	1,323
Total Louisiana	1,524	211	632	2,367	1,493	196	758	2,447
Michigan	426	23	476	925	348	30	459	837
Mississippi	161	5	167	333	124	9	180	313
Montana	138	54	87	279	154	20	96	270
Nebraska, Missouri	12	6	31	49	78	20	100	198
New Mexico	334	53	114	501	396	88	123	607
Oklahoma	2,483	213	1,612	4,308	3,304	249	1,812	5,365
Pennsylvania, New York, Ohio, West Virginia	1,838	867	526	3,231	1,579	872	543	2,994
Texas:								
Gulf Coast	1,103	182	695	1,980	1,390	153	760	2,303
West Coast	2,788	24	446	3,258	4,117	16	865	4,998
East Texas	792	50	265	1,107	801	51	300	1,152
Other districts	3,930	490	2,854	7,274	4,357	427	3,272	8,056
Total Texas	8,613	746	4,260	13,619	10,665	647	5,197	16,509
Wyoming	322	8	257	587	365	18	232	615
Other States	37	6	99	142	7	3	60	70
Total United States	22,042	2,887	12,727	37,656	24,430	2,843	14,757	42,030

The total number of producing oil wells in the United States rose from 437,880 at the end of 1948 to 448,680 at the end of 1949, while the average production per well declined from 12.8 to 11.4 barrels per day. The average daily production per well in 1949 ranged from a peak of 89.1 barrels in Colorado to 0.4 barrel in Pennsylvania.

TABLE 35.—Producing oil wells in the United States and average production per day in 1949–50, by States and districts

State and district	Producing oil wells			
	1949		1950 [1]	
	Approximate number, Dec. 31	Average production per well per day (barrels)	Approximate number, Dec. 31	Average production per well per day (barrels)
Arkansas	3,660	22.4	3,700	23.2
California	24,350	35.9	28,080	34.2
Colorado	750	89.1	770	84.2
Illinois	27,100	6.6	27,500	6.2
Indiana	2,950	9.3	3,410	8.6
Kansas	29,600	9.7	31,000	9.7
Kentucky	15,500	1.6	15,650	1.8
Louisiana:				
Gulf Coast	4,690	90.6	5,060	92.7
Northern	6,200	20.6	6,800	18.6
Total Louisiana	10,890	50.6	11,860	50.4
Michigan	3,820	12.3	3,900	11.2
Mississippi	1,400	74.3	1,670	68.3
Montana	3,180	8.0	3,300	6.9
Nebraska	60	16.4	140	42.4
New Mexico	5,580	23.8	6,020	22.7
New York	23,000	.5	23,200	.5
Ohio	19,900	.5	18,580	.5
Oklahoma	54,400	7.7	56,800	8.1
Pennsylvania	82,100	.4	81,190	.4
Texas: [2]				
Gulf Coast	16,700	32.2	17,100	32.1
West Texas	26,200	25.1	30,400	27.8
East Texas proper	23,000	11.2	23,200	11.6
Other districts	54,000	12.1	57,800	12.1
Total Texas	119,900	17.5	128,500	18.3
West Virginia	15,400	.5	15,000	.5
Wyoming	4,950	27.5	5,320	32.3
Other States [3]	190	25.9	230	32.6
Total United States	448,680	11.4	465,820	11.8

[1] Preliminary figures.
[2] The breakdown of Texas districts has been changed to agree with the Texas Railroad Commission divisions.
[3] Alabama, Florida, Missouri, Tennessee, Utah, and Virginia.

CONSUMPTION AND DISTRIBUTION

The indicated total demand[4] for crude was 2,154.5 million barrels in 1950, an average of 5,903,000 barrels daily and an increase of 427,000 barrels daily, or 7.8 percent, compared with 1949. This record demand for crude was 102,000 barrels daily above the previous record in 1948.

Of the total indicated demand, domestic crude supplied 1,844.2 million barrels in 1949 and 1,978.0 million in 1950, a gain of 7.3 percent. Production amounted to 1,971.8 million barrels, while stocks declined 6.2 million barrels. The demand for foreign crude was 176.4 million barrels in 1950, a gain of 13.9 percent. Imports were 177.7 million barrels, and stocks increased 1.3 million. Foreign crude met 5.9 percent of the total demand for crude in 1948, 7.7 percent in 1949, and 8.2 percent in 1950.

Runs to Stills.—Total runs of crude at refineries amounted to 2,094.9 million barrels in 1950 or 5,739,000 barrels daily—a gain of 7.7 percent compared with 1949 and 142,000 barrels daily over the previous record of 1948. The total advance of 150.7 million barrels over 1949 comprised an increase of 129.1 million in runs of domestic crude and 21.6 million in runs of foreign crude. The runs of foreign crude amounted to 6.1 percent of total runs in 1948, 7.9 percent in 1949, and 8.4 percent in 1950. Runs to stills in districts east of California rose from 83.5 percent of the United States total in 1949 to 84.7 percent in 1950, while runs in the California district dropped from 16.5 percent to 15.3. Changes in total runs, by districts, in 1950 compared with 1949 included gains of 51.0 million barrels for the East Coast district, 45.2 million for Indiana-Illinois, 22.1 million for Oklahoma-Kansas, 13.6 million for the Louisiana Gulf district, 11.0 million for the Texas Gulf district, 7.9 million for the Mountain district, 3.8 million for the Appalachian district, and 0.4 million for California. Decreases in total runs were 3.0 million barrels in the Texas Inland district and 1.3 million for Inland Louisiana-Arkansas.

[4] For definition, *see* footnote 1 at beginning of this chapter.

TABLE 36.—Runs to stills of crude petroleum in the United States in 1950, by districts and months [1]

[Thousands of barrels]

District [2]	January	February	March	April	May	June	July	August	September	October	November	December	Total
East Coast:													
Domestic	12,441	10,080	10,996	12,958	14,758	13,778	15,866	14,630	14,661	14,671	13,974	14,814	163,627
Foreign	14,003	11,869	14,105	13,174	14,014	13,925	14,014	15,624	14,825	14,386	13,126	14,676	167,741
Total East Coast	26,444	21,949	25,101	26,132	28,772	27,703	29,880	30,254	29,486	29,057	27,100	29,490	331,368
Appalachian	5,045	4,261	4,983	4,801	5,257	4,897	5,235	5,245	5,341	5,353	5,012	4,952	60,382
Indiana, Illinois, Kentucky, etc.	31,030	27,430	31,976	28,058	31,023	31,267	33,793	33,170	29,795	33,660	33,741	34,200	379,143
Oklahoma, Kansas, etc.	13,892	12,608	13,210	12,895	15,348	15,056	16,180	16,448	15,312	15,329	15,079	15,928	177,285
Texas Inland	6,000	5,774	6,181	5,797	6,590	6,260	6,633	6,965	6,366	6,650	6,364	6,641	76,221
Texas Gulf Coast:													
Domestic	38,661	33,714	37,660	31,789	35,550	35,108	38,915	42,276	43,251	46,103	42,749	46,072	471,848
Foreign	701	377	608	632	256	567	369	659	958	555	932	623	7,237
Total Texas Gulf Coast	39,362	34,091	38,268	32,421	35,806	35,675	39,284	42,935	44,209	46,658	43,681	46,695	479,085
Louisiana Gulf Coast:													
Domestic	13,855	12,327	13,347	13,250	14,563	13,415	15,047	15,035	14,677	14,873	14,605	15,378	170,372
Foreign	----------	----------	23	22	101	270	40	133	191	112	64	79	1,035
Total Louisiana Gulf Coast	13,855	12,327	13,370	13,272	14,664	13,685	15,087	15,168	14,868	14,985	14,669	15,457	171,407
Arkansas, Louisiana Inland, etc.	2,115	2,034	1,979	2,100	2,222	2,051	2,294	2,213	2,326	2,375	2,262	2,136	26,107
Rocky Mountain	5,817	5,285	5,629	5,114	5,467	6,335	6,517	6,836	6,247	5,684	6,557	7,051	72,539
California:													
Domestic	26,427	23,078	24,721	25,207	26,450	26,734	27,427	28,844	27,828	28,642	28,074	27,898	321,330
Foreign	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
Total California	26,427	23,078	24,721	25,207	26,450	26,734	27,427	28,844	27,828	28,642	28,074	27,898	321,330
Total United States: Domestic	155,283	136,591	150,682	141,969	157,228	154,901	167,907	171,662	165,804	173,340	168,417	175,070	1,918,854
Foreign	14,704	12,246	14,736	13,828	14,371	14,762	14,423	16,416	15,974	15,053	14,122	15,378	176,013
Grand total: 1950	169,987	148,837	165,418	155,797	171,599	169,663	182,330	188,078	181,778	188,393	182,539	190,448	2,094,867
1949	175,295	153,440	165,919	154,223	161,053	154,539	160,088	162,162	162,429	166,568	158,782	169,723	1,944,221
Daily average 1950	5,483	5,316	5,336	5,193	5,535	5,655	5,882	6,067	6,059	6,077	6,085	6,143	5,739

[1] Preliminary figures.
[2] Where no breakdown is shown, runs were all of domestic crude.

Distribution.—The increased consumption of domestic crude in 1950 was primarily a result of the 11.0-percent increase in the total demand for all oils compared with 1949, but was proportionately less than this because other components of total petroleum supply increased at a greater rate. The domestic production of light liquids from natural gas gained 15.6 percent, and total imports increased 31.2 percent. Furthermore, stocks of refined products were reduced 16.0 million barrels in 1950 compared with a reduction of only 0.8 million in 1949 and a gain of 79.8 million in 1948. The demand for domestic crude in 1950 was met by an output of 1,971.8 million barrels and a reduction of 6.2 million barrels in stocks of domestic crude.

The Bureau of Mines collects data relating to the receipts of domestic and foreign crude petroleum at refineries in the United States. These receipts provide the crude for total runs to stills at refineries, for small amounts of crude used as refinery fuel, and for any increase in crude stocks at refineries. Classification of the receipts by States of origin shows the amount received from local production (intrastate), the receipts from other States (interstate), and receipts of imported crude. The classification of receipts by method of transportation indicates the mode of final delivery—boat, pipeline, or tank car–truck. The receipts of domestic crude by boat were, in most instances, originally moved by pipeline from the point of production to the point of shipment by boat.

Receipts of domestic and foreign crude at refineries amounted to 2,100.4 million barrels in 1950 and, allowing for an increase of 2.9 million barrels in crude stocks at refineries, indicated a refinery consumption of 2,097.5 million barrels of crude, including total crude runs of 2,094.9 million barrels and 2.6 million barrels for crude used as fuel and losses. Receipts of foreign crude amounted to 177.7 million barrels or 8.5 percent of the total, interstate receipts of domestic crude oil were 779.2 million barrels or 37.1 percent of the total, and intrastate receipts of 1,143.5 million represented 54.4 percent of the total.

Of total refinery receipts of crude in 1950, 73.4 percent was delivered by pipeline, 25.1 percent by boat, and 1.5 percent by tank car and truck.

TABLE 37.—Demand for domestic crude petroleum in continental United States, 1947–50, by States of origin

[Thousands of barrels]

State	1947		1948		1949		1950 [1]	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
Alabama	408	1.1	441	1.2	492	1.3	664	1.8
Arkansas	29,511	80.8	31,569	86.2	30,159	82.6	32,030	87.8
California	330,830	906.4	336,554	919.5	328,628	900.4	334,328	916.0
Colorado	15,869	43.5	17,337	47.4	23,496	64.4	23,714	65.0
Florida	168	.5	326	.9	345	.9	534	1.5
Illinois	71,828	196.8	61,531	168.4	65,302	178.9	64,689	177.2
Indiana	6,111	16.7	6,793	18.6	9,817	26.9	9,848	27.0
Kansas	106,200	291.0	109,624	299.5	102,890	281.9	106,057	290.6
Kentucky	9,963	27.3	8,728	23.8	8,310	22.8	10,492	28.7
Louisiana	160,352	439.3	179,423	490.2	189,516	519.2	209,678	574.5
Michigan	16,570	45.4	16,610	45.4	16,601	45.5	16,224	44.4
Mississippi	35,246	96.6	45,675	124.8	38,400	105.2	37,712	103.3
Montana	8,393	23.0	9.314	25.4	9,038	24.8	7,993	22.0
Nebraska	226	.6	215	.6	315	.9	1,524	4.2
New Mexico	40,889	112.0	47,349	129.4	47,064	128.9	49,070	134.4
New York	4,741	13.0	4,612	12.6	4,434	12.2	4,125	11.3
Ohio	3,057	8.4	3,499	9.5	3,549	9.7	3,301	9.0
Oklahoma	144,379	395.5	153,664	419.8	150,569	412.5	164,816	451.5
Pennsylvania	12,812	35.1	12,178	33.3	11,333	31.1	12,444	34.1
Texas	810,557	2,220.7	898,157	2,454.0	752,933	2,062.8	822,214	2,252.6
Utah	------	------	13	------	613	1.7	1,221	3.3
West Virginia	2,701	7.4	2,597	7.1	2,900	7.9	2,872	7.9
Wyoming	45,545	124.8	52,066	142.2	47,357	129.7	62,417	171.0
Other States [2]	123	.3	82	.2	112	.3	68	.2
Total United States	1,856,479	5,086.2	1,998,357	5,460.0	1,844,173	5,052.5	1,978,035	5,419.3

[1] Preliminary figures.
[2] Missouri, Tennessee, and Virginia.

Deliveries to refineries by boat totaled 527.5 million barrels in 1950. Deliveries of foreign crude totaled 177.7 million barrels, of which 168.8 million barrels went to the East Coast district, 7.5 million to the Texas Gulf Coast district, and 1.4 million to the Lousiana Gulf Coast district. The interstate movement of domestic crude by boat amounted to 221.2 million barrels, including 160.4 million shipped from the Gulf Coast to the East Coast district, 45.8 million of exchanges by boat between the Texas Gulf and Lousiana Gulf districts, and 15.0 million barrels representing river shipments to Kentucky refineries. The intrastate deliveries by boat amounted to 128.6 million barrels in 1950, including 48.3 million in California, 40.0 million in the Louisiana Gulf district, 35.3 million in the Texas Gulf district, and 5.0 million in Kentucky.

Deliveries to refineries by tank cars and trucks in 1950 totaled 31.6 million barrels, including 15.4 million intrastate and 16.2 interstate. The largest intrastate movements were 5.8 million barrels in California, 2.0 million in the Texas Gulf, 1.3 million in Michigan, 1.1 million in Wyoming, 1.1 million in Kansas, and 1.0 million in Colorado. The principal interstate movements were 3.9 million barrels to the Louisiana Gulf district, 2.9 million to Illinois, 1.5 million to Washington, 1.3 million to Inland Louisiana, 1.1 million to Kentucky, and 0.9 million to Colorado.

TABLE 38.—Receipts of crude petroleum at refineries in the United States, 1946–50, by method of transportation

[Millions of barrels]

Method of transportation	1946	1947	1948	1949	1950 [1]
By boat:					
Intrastate	96.7	108.5	120.9	112.2	128.6
Interstate	226.2	241.0	265.1	211.8	221.2
Foreign	86.1	97.5	129.1	154.9	177.7
Total by boat	409.0	447.0	515.1	478.9	527.5
By pipeline:					
Intrastate	888.9	912.9	984.7	938.1	998.7
Interstate	401.4	449.7	490.0	495.7	542.6
Total by pipeline	1,290.3	1,362.6	1,474.7	1,433.8	1,541.3
By tank car and truck:					
Intrastate	20.1	19.9	24.0	17.4	16.2
Interstate	17.8	26.1	32.8	15.4	15.4
Total by tank car and truck	37.9	46.0	56.8	32.8	31.6
Grand total	1,737.2	1,855.6	2,046.6	1,945.5	2,100.4

[1] Preliminary figures.

The East Coast refinery district is a major market for crude brought in from outside sources. Receipts of crude in 1950 totaled 333.4 million barrels compared with 280.2 million in 1949. Receipts of foreign crude by boat increased from 136.5 million barrels in 1949 to 168.8 million in 1950. Interstate receipts of domestic crude increased from 143.7 million barrels in 1949 to 164.6 million in 1950. The receipts of domestic crude in 1950 included 160.3 million by interstate boats, 4.1 million by pipeline from the Appalachian district, and 0.2 million by tank cars and trucks. The total increase in receipts of all crudes in 1950 compared with 1949 was 53.2 million barrels, including gains of 32.3 million in foreign crude and 20.9 million in domestic. The principal changes in the receipts of domestic crude were gains of 10.1 million barrels from Louisiana, 8.6 million from Texas, and 2.2 million from Mississippi.

The demand for domestic crude in 1950 totaled 1,978.0 million barrels compared with 1,844.2 million in 1949, a gain of 133.8 million or 7.3 percent. Twenty-one States had an annual demand of over 1 million barrels in 1950, with Nebraska and Utah added to the list. Of these States, 14 showed increases in demand in 1950 compared with 1949, and 7 reported declines. The principal gains were 69.3 million barrels for Texas, 20.2 million for Louisiana, 15.1 million for Wyoming, 14.3 million for Oklahoma, 5.7 million for California, 3.2 million for Kansas, 2.2 million for Kentucky, 2.0 million for New Mexico, 1.9 million for Arkansas, 1.2 million for Nebraska, and 1.1 million barrels for Pennsylvania. The principal declines in demand were 1.0 million barrels for Montana, 0.7 million for Mississippi, 0.6 million for Illinois, 0.4 million for Michigan, 0.3 million for New York, and 0.2 for Ohio. Considering the substantial gain in the demand for crude, the small gains or declines were primarily in States with static or decreasing production.

The demand for Texas crude rose from 752.9 million barrels in 1949 to 822.2 million in 1950, a gain of 9.2 percent. Stocks of Texas crude increased 7.0 million barrels during the year. The relative contribution of Texas to meeting the total demand for domestic crude declined from 45.0 percent in 1948 to 40.8 percent in 1949 and increased to 41.6 percent in 1950. Its contribution, however, was still 76.0 million barrels below the peak of 1948. The deliveries of Texas crude to refineries in the United States increased from 746.1 million barrels in 1949 to 812.5 million in 1950—a gain of 66.4 million, including increases of 30.4 million barrels in deliveries to Texas refineries and of 36.0 million in deliveries to refineries in other States. Deliveries to the Indiana-Illinois refinery district increased 22.9 million barrels, to the East Coast district 8.5 million, to the Oklahoma-Kansas district 7.6 million, and to the Appalachian district 0.1 million, while deliveries to Louisiana refineries declined 3.1 million.

California ranked second as a source of domestic crude, supplying 334.3 million barrels in 1950, a gain of 5.7 million or 1.7 percent. California supplied 16.8 percent of the total demand for domestic crude in 1948, 17.8 percent in 1949, and 16.9 percent in 1950. Stocks of California crude were reduced 6.7 million barrels in 1950. California shipped 23.5 million barrels of oil products to the East Coast in 1950 compared to 7.6 million in 1949. This movement was a primary reason for the reduction of total product stocks in the California district by 21.2 million barrels in 1950 compared with an increase in such stocks of 13.5 million in 1949.

Louisiana was the third largest source of domestic crude, supplying 9.0 percent of the total market demand in 1948, 10.3 percent in 1949, and 10.6 percent in 1950. The market demand for Louisiana crude rose from 189.5 million barrels in 1949 to 209.7 million in 1950, a gain of 10.7 percent. Stocks of Louisiana crude decreased 0.6 million barrels during 1950. Deliveries of Louisiana crude to refineries totaled 202.6 million barrels in 1950, including 106.5 million to refineries within the State and 96.1 million to refineries in other States. Of the total increase of 20.5 million barrels in deliveries of crude to refineries, 17.2 million was in deliveries to Louisiana refineries and only 3.3 million to those in other States. While deliveries to the East Coast district increased 10.1 million barrels and to the Indiana-Illinois district 1.0 million, shipments to the Texas Gulf district declined 6.3 million, to Arkansas 0.9 million, and to the Appalachian district 0.6 million barrels.

Oklahoma ranked fourth in supplying the demand for domestic crude in 1950, furnishing 8.3 percent of the total compared to 8.2 percent in 1949 and 7.7 percent in 1948. The total demand for Oklahoma crude rose from 150.6 million barrels in 1949 to 164.8 million in 1950, a gain of 9.5 percent. Stocks of Oklahoma crude increased 0.1 million barrels in 1950. Deliveries of crude to refineries in 1950 amounted to 141.4 million barrels, including 64.4 million to refineries in Oklahoma and 77.0 million to other States. Interstate deliveries included 58.3 million barrels to the Indiana-Illinois refinery district, 11.4 million to Kansas and Missouri, 5.2 million to the Appalachian districts, and 2.1 million to Texas refineries.

Kansas ranked fifth as a source of domestic crude in 1950 and supplied 5.4 percent of the total compared with 5.6 percent in 1949. The market demand for Kansas crude increased from 102.9 million barrels in 1949 to 106.1 million in 1950, a gain of 3.1 percent. Stocks

TABLE 39.—Daily average demand for total crude petroleum in the United States in 1949–50, by States of origin and months

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
1949													
Alabama	1.2	1.1	1.7	1.4	1.1	1.0	1.1	1.9	1.7	1.1	1.6	1.4	1.3
Arkansas	98.2	89.3	75.3	90.9	93.5	69.4	71.2	91.2	80.1	72.2	84.1	76.6	82.6
California	957.5	924.2	948.7	916.6	925.9	937.0	861.8	892.2	886.3	839.9	873.1	843.6	900.4
Colorado	59.8	65.7	64.4	58.0	57.9	68.1	68.7	61.8	70.0	65.2	65.4	67.6	64.4
Florida	.2	2.9	1.0	1.4	.9	1.5	1.1	1.8	.1	.2	.1	.5	.9
Illinois	152.8	180.8	153.8	169.5	187.1	160.4	212.3	205.9	214.9	193.1	160.8	155.3	178.9
Indiana	23.3	22.8	21.4	25.1	27.5	26.6	26.5	28.0	28.7	30.8	31.3	30.4	26.9
Kansas	304.2	316.9	295.1	272.4	278.7	274.3	293.7	229.5	273.2	294.7	263.7	288.4	281.9
Kentucky	19.4	17.2	23.9	19.3	20.6	21.0	21.6	21.7	24.0	27.9	30.7	25.4	22.8
Louisiana	543.5	479.1	474.9	537.2	496.5	497.9	509.9	497.1	580.3	551.6	499.6	560.9	519.2
Michigan	48.0	47.4	45.9	36.3	45.4	43.0	36.9	49.7	51.2	49.0	44.8	48.1	45.5
Mississippi	109.7	112.9	112.4	98.8	103.0	108.8	97.5	113.2	101.7	102.7	93.0	108.9	105.2
Missouri, Tennessee, Virginia	.3	.3	.2	.2	.3	.3	.3	.4	.3	.4	.3	.3	.3
Montana	26.7	27.4	25.4	20.3	27.1	24.9	20.4	27.2	23.7	24.9	24.9	24.3	24.8
Nebraska	.7	.6	.7	.7	.4	.4	.9	.9	1.0	1.1	1.5	1.4	.9
New Mexico	137.4	122.2	129.7	147.0	105.2	121.8	136.5	166.7	131.7	114.7	120.4	113.4	128.9
New York	12.4	12.6	12.7	12.2	12.4	12.7	8.8	11.9	14.2	12.0	12.2	11.9	12.2
Ohio	10.7	8.3	6.7	8.8	9.6	9.9	11.0	11.9	10.2	9.9	10.2	9.2	9.7
Oklahoma	424.2	383.7	388.7	428.8	403.5	356.4	405.5	476.1	412.3	412.6	413.1	441.3	412.5
Pennsylvania	31.7	33.3	27.8	31.1	27.9	35.0	27.1	28.0	29.9	35.1	32.7	33.3	31.1
Texas	2,249.5	2,237.6	2,103.6	1,931.7	1,976.6	1,955.5	1,960.0	1,935.5	2,087.9	2,126.4	2,120.3	2,081.3	2,062.8
Utah	.4	.4	.7	.5	1.0	1.6	1.7	2.2	2.8	2.8	3.1	2.8	1.7
West Virginia	8.1	9.8	5.1	7.2	8.4	8.9	6.1	8.7	8.3	6.1	11.8	7.2	7.9
Wyoming	127.2	102.1	127.3	111.4	115.1	135.3	144.2	135.5	155.6	114.9	132.9	153.2	129.7
Total domestic crude	5,347.1	5,198.6	5,047.1	4,926.8	4,925.6	4,871.7	4,924.8	4,999.0	5,190.1	5,089.3	5,031.6	5,086.7	5,052.5
Foreign crude	431.2	396.4	416.1	377.1	414.0	401.0	417.9	414.8	410.8	445.9	446.1	510.9	423.9
Grand total 1949	5,778.3	5,595.0	5,463.2	5,303.9	5,339.6	5,272.7	5,342.7	5,413.8	5,600.9	5,535.2	5,477.7	5,597.6	5,476.4
1950 [1]													
Alabama	.9	1.6	2.1	1.4	1.7	1.7	2.1	1.5	2.3	2.1	2.5	1.9	1.8
Arkansas	85.5	92.3	85.0	93.6	94.2	83.7	85.4	89.3	80.7	92.7	89.3	81.7	87.8
California	891.3	861.2	848.3	891.5	901.5	918.4	911.7	962.1	955.0	962.5	964.2	920.7	916.0
Colorado	64.3	62.4	60.8	57.8	60.4	57.7	66.0	56.3	61.4	76.0	78.5	77.6	65.0
Florida	1.3	1.8	.3	1.8	.9	.1	.5	3.3	4.0	.1	1.5	1.9	1.5
Illinois	193.4	194.8	168.7	214.4	187.9	175.3	153.1	177.5	174.9	171.5	150.5	166.7	177.2
Indiana	24.6	24.4	24.8	27.8	28.3	27.5	29.8	27.3	28.0	27.7	28.6	24.8	27.0
Kansas	275.8	262.6	284.1	274.1	314.3	276.8	322.0	309.9	299.4	273.3	292.7	298.4	290.6
Kentucky	23.9	25.1	26.7	28.6	32.4	26.5	29.1	31.5	29.4	35.7	33.9	22.0	28.7
Louisiana	535.8	530.0	547.2	511.3	537.8	549.7	611.7	592.2	621.3	591.9	617.3	643.2	574.5
Michigan	50.1	47.1	44.6	45.1	45.9	34.3	51.7	45.0	45.1	38.9	42.2	43.2	44.4

Mississippi	95.1	98.3	90.0	106.3	110.6	106.1	103.8	111.5	104.5	118.1	93.6	101.4	103.3
Missouri, Tennessee, Virginia	.3	.1	.3	.2	.3	.1	.2	.3	.1	.3	.1	.2	.2
Montana	22.4	23.7	23.5	17.4	18.8	22.7	23.0	25.1	21.1	15.9	23.7	25.5	21.9
Nebraska	2.1	1.8	2.1	1.4	2.8	2.9	3.8	4.6	5.9	7.7	6.8	7.9	4.2
New Mexico	138.3	146.7	138.5	146.5	157.0	140.1	113.9	130.2	109.0	117.6	149.2	127.7	134.4
New York	12.2	8.7	12.0	10.3	11.4	9.9	9.7	13.1	12.0	12.5	11.6	11.9	11.3
Ohio	12.1	9.7	8.5	5.8	5.7	8.7	11.3	9.5	8.4	7.4	11.3	10.0	9.0
Oklahoma	430.5	436.7	436.1	388.1	457.0	480.6	502.3	429.9	435.5	448.0	497.1	475.3	451.6
Pennsylvania	32.3	33.5	28.9	34.9	33.8	32.7	34.5	35.7	42.0	36.8	31.9	32.3	34.1
Texas	2,093.2	2,006.8	1,956.9	1,878.1	2,099.6	2,141.2	2,307.5	2,458.7	2,488.3	2,601.2	2,471.9	2,503.5	2,252.6
Utah	2.5	3.0	3.4	3.4	3.3	3.4	3.4	3.4	3.3	3.7	3.8	3.6	3.3
West Virginia	7.1	7.9	8.0	6.7	7.1	8.3	9.5	9.0	7.8	8.4	7.0	7.5	7.9
Wyoming	157.0	161.5	152.7	158.9	157.9	194.1	184.3	201.3	175.0	141.2	171.7	196.0	171.0
Total domestic crude	5,152.0	5,041.7	4,953.5	4,905.4	5,270.6	5,302.5	5,570.3	5,728.2	5,714.4	5,791.2	5,780.9	5,784.9	5,419.3
Foreign crude	475.0	438.0	477.0	461.7	464.5	492.6	465.5	530.2	534.9	486.0	473.0	498.2	483.3
Grand total 1950	5,627.0	5,479.7	5,430.5	5,367.1	5,735.1	5,795.1	6,035.8	6,258.4	6,249.3	6,277.2	6,253.9	6,283.1	5,902.6

[1] Preliminary figures.

232284—53——59

TABLE 40.—Demand for total crude petroleum in the United States, 1949–50, by States of origin and months

[Thousands of barrels]

State	January	February	March	April	May	June	July	August	September	October	November	December	Year
1949													
Alabama	38	30	54	42	35	31	35	52	50	34	47	44	492
Arkansas	3,044	2,501	2,334	2,726	2,898	2,081	2,208	2,827	2,404	2,239	2,523	2,374	30,159
California	29,683	25,879	29,409	27,497	28,704	28,111	26,715	27,657	26,589	26,037	26,194	26,153	328,628
Colorado	1,855	1,840	1,995	1,741	1,794	2,043	2,129	1,917	2,101	2,022	1,963	2,096	23,496
Florida	5	82	32	41	28	44	33	56	1	5	3	15	345
Illinois	4,738	5,061	4,769	5,084	5,801	4,811	6,583	6,384	6,445	5,986	4,825	4,815	65,302
Indiana	723	639	664	752	854	798	821	868	860	956	940	942	9,817
Kansas	9,430	8,872	9,147	8,173	8,640	8,229	9,106	7,114	8,196	9,134	7,910	8,939	102,890
Kentucky	601	482	741	578	638	630	670	674	721	865	922	788	8,310
Louisiana	16,847	13,415	14,721	16,117	15,390	14,936	15,800	15,411	17,407	17,098	14,987	17,387	189,516
Michigan	1,489	1,327	1,422	1,090	1,406	1,289	1,145	1,540	1,537	1,520	1,345	1,491	16,601
Mississippi	3,400	3,162	3,484	2,965	3,194	3,264	3,023	3,508	3,051	3,184	2,790	3,375	38,400
Missouri, Tennessee, Virginia	8	7	9	7	10	8	10	12	10	11	10	10	[1] 112
Montana	829	767	787	609	841	747	633	843	712	771	746	753	9,038
Nebraska	21	18	20	21	12	13	28	28	30	35	44	45	315
New Mexico	4,260	3,422	4,021	4,409	3,262	3,655	4,231	5,169	3,952	3,556	3,612	3,515	47,064
New York	384	352	393	365	383	382	274	370	425	373	365	368	4,434
Ohio	333	232	208	265	299	296	342	369	307	307	306	285	3,549
Oklahoma	13,149	10,745	12,051	12,863	12,507	10,693	12,571	14,758	12,369	12,792	12,392	13,679	150,569
Pennsylvania	982	932	863	933	865	1,051	840	869	898	1,087	981	1,032	11,333
Texas	69,735	62,652	65,210	57,951	61,274	58,665	60,760	60,002	62,637	65,918	63,608	64,521	752,933
Utah	12	10	20	17	31	48	53	69	84	88	94	87	613
West Virginia	250	275	158	215	260	268	188	271	248	188	355	224	2,900
Wyoming	3,944	2,860	3,947	3,343	3,567	4,058	4,471	4,201	4,669	3,561	3,987	4,749	47,357
Total domestic crude	165,760	145,562	156,459	147,804	152,693	146,151	152,669	154,969	155,703	157,767	150,949	157,687	1,844,173
Foreign crude	13,366	11,099	12,900	11,312	12,834	12,031	12,954	12,860	12,324	13,824	13,382	15,838	154,724
Grand total 1949	179,126	156,661	169,359	159,116	165,527	158,182	165,623	167,829	168,027	171,591	164,331	173,525	1,998,897
Daily average:													
Domestic crude	5,347	5,199	5,047	4,927	4,926	4,872	4,925	4,999	5,190	5,089	5,032	5,087	5,052
Domestic and foreign crude	5,778	5,595	5,463	5,304	5,340	5,273	5,343	5,414	5,601	5,535	5,478	5,598	5,476
1950 [2]													
Alabama	28	45	67	41	54	51	64	46	68	64	76	60	664
Arkansas	2,649	2,584	2,634	2,810	2,919	2,511	2,649	2,769	2,420	2,874	2,679	2,532	32,030
California	27,629	24,114	26,298	26,746	27,946	27,551	28,262	29,825	28,650	29,839	28,925	28,543	334,328
Colorado	1,994	1,748	1,886	1,736	1,872	1,729	2,045	1,746	1,842	2,355	2,356	2,405	23,714
Florida	41	50	10	54	27	4	16	104	119	4	45	60	534
Illinois	5,995	5,454	5,230	6,432	5,826	5,256	4,746	5,502	5,247	5,318	4,515	5,168	64,689
Indiana	763	683	768	834	878	827	924	845	840	859	859	768	9,848
Kansas	8,550	7,353	8,808	8,224	9,742	8,303	9,982	9,607	8,983	8,472	8,782	9,251	106,057

Kentucky	741	702	827	858	1,005	796	901	976	880	1,107	1,015	684	10,492
Louisiana	16,610	14,839	16,964	15,339	16,670	16,490	18,962	18,357	18,641	18,348	18,518	19,940	209,678
Michigan	1,554	1,320	1,383	1,352	1,424	1,030	1,603	1,396	1,353	1,205	1,264	1,340	16,224
Mississippi	2,949	2,751	2,790	3,189	3,428	3,184	3,218	3,457	3,134	3,661	2,807	3,144	37,712
Missouri, Tennessee, Virginia	9	4	7	5	7	4	6	7	4	7	4	4	[3] 68
Montana	695	662	728	523	583	681	715	779	632	495	710	790	7,993
Nebraska	65	49	66	43	86	88	119	144	178	238	204	244	1,524
New Mexico	4,288	4,108	4,293	4,394	4,867	4,202	3,531	4,036	3,271	3,646	4,476	3,958	49,070
New York	377	245	372	310	354	295	300	405	361	388	349	369	4,125
Ohio	375	271	265	174	177	260	351	296	251	231	340	310	3,301
Oklahoma	13,346	12,229	13,519	11,642	14,166	14,419	15,571	13,326	13,065	13,887	14,913	14,733	164,816
Pennsylvania	1,001	938	895	1,048	1,048	981	1,070	1,106	1,259	1,141	955	1,002	12,444
Texas	64,889	56,191	60,663	56,342	65,088	64,237	71,532	76,220	74,648	80,637	74,158	77,609	822,214
Utah	77	84	105	101	103	102	105	104	100	114	114	112	1,221
West Virginia	221	220	249	200	222	249	295	281	235	259	209	232	2,872
Wyoming	4,866	4,523	4,734	4,766	4,895	5,824	5,712	6,241	5,251	4,378	5,152	6,075	62,417
Total domestic crude	159,712	141,167	153,561	147,163	163,387	159,074	172,679	177,575	171,432	179,527	173,425	179,333	1,978,035
Foreign crude	14,726	12,265	14,786	13,850	14,400	14,779	14,431	16,435	16,046	15,065	14,191	15.443	176,417
Grand total 1950	174,438	153,432	168,347	161,013	177,787	173,853	187,110	194,010	187,478	194,592	187,616	194,776	2,154,452
Daily average:													
Domestic crude	5,152	5,042	4,954	4,905	5,271	5,302	5,570	5,728	5,714	5,791	5,781	5,785	5,419
Domestic and foreign crude	5,627	5,480	5,431	5,367	5,735	5,795	6,036	6,258	6,249	6,277	6,254	6,283	5,903

[1] Missouri (51), Tennessee (18), and Virginia (43).
[2] Preliminary figures.
[3] Missouri (28), Tennessee (20), and Virginia (20).

TABLE 41.—Summary of crude-oil receipts and consumption at refineries, 1950 [1]

[Thousands of barrels]

Receiving States	Intrastate receipts	Interstate receipts from						Total receipts	Change in refinery stocks [11]	Crude runs to stills [11]	Fuel and Losses
		Illinois	Louisiana	Oklahoma	Texas	Other	Total				
Arkansas	18,859		1,310				1,310	20,169	−120	20,294	−5
California [2]	319,576					1,448	1,448	321,024	−906	321,330	600
Colorado	1,182					5,265	5,265	6,447	−44	6,489	2
Georgia [3]									−106	3,904	23
Illinois [4]	26,819		18	23,185	46,153	32,877	102,233	129,052	812	128,249	−9
Indiana	519	3,938		18,705	69,363	33,665	125,671	126,190	318	125,874	−2
Kansas [5]	59,282			10,384	2,289	1,506	14,179	73,461	310	73,060	91
Kentucky [6]	7,771	1,357	6,931		99	9,560	17,947	25,718	−188	25,899	7
Louisiana [7]	106,468				33,851	36,121	69,972	176,440	314	177,220	328
Maryland			732		11,318	220	12,270	12,270	142	19,573	82
Massachusetts [8]			745		3,142		3,887	3,887	125	9,977	5
Michigan	16,826	1,316		1,608	7,949	2,104	12,977	29,803	369	29,121	313
Missouri				975	10,669	2,164	13,808	13,808	22	13,786	
Montana	6,654					9,381	9,381	16,035	−23	16,057	1
New Jersey [9]			12,588		49,143	6,698	68,429	68,429	219	128,496	528
New Mexico	4,040				930		930	4,970	4	4,964	2
New York:											
East					893	4,295	5,188	5,188	261	12,098	16
West	2,855	3,041			7,086	1,039	11,166	14,021	88	13,851	82
Ohio:											
East	6,190	14,136	436	1,627		2,867	19,066	25,256	−23	25,267	12
West	1,363	10,794	4,030	14,826	29,452	9,976	69,078	70,441	425	70,000	16
Oklahoma	64,423				15,111	11,535	26,646	91,069	481	90,439	149
Pennsylvania:											
East			13,720		60,964	103	74,787	74,787	550	157,320	191
West	10,404	599		2,079	2,420	1,609	6,707	17,111	−137	17,247	1
Texas	461,628		55,572	2,103		28,613	86,288	547,916	8	555,306	51
Utah	1,219					16,055	16,055	17,274	−39	17,234	79
West Virginia	2,013	142		1,509		356	2,007	4,020	2	4,017	1
Wyoming [10]	25,417					2,452	2,452	27,869	59	27,795	15
United States total	1,143,508	35,323	96,082	77,001	350,832	219,909	779,147	1,922,655	2,923	2,094,867	2,579
Daily average	3,133	97	263	211	961	603	2,135	5,268	8	5,739	7

[1] Preliminary. [2] Includes Washington. [3] Includes South Carolina. [4] Includes Minnesota and Wisconsin. [5] Includes Nebraska. [6] Includes Tennessee. [7] Includes Alabama and Mississippi. [8] Includes Rhode Island. [9] Includes Florida. [10] Includes Idaho. [11] Includes foreign crude.

of Kansas crude increased 1.5 million barrels in 1950. Total deliveries of crude to refineries amounted to 106.2 million barrels in 1950, including 59.3 million to refineries in the State and 46.9 million to refineries in other districts. Deliveries to the Indiana-Illinois district amounted to 35.4 million barrels, 10.9 million went to refineries in Oklahoma and Missouri, and 0.6 million went to the Appalachian district.

Illinois ranked sixth in importance in supplying the market demand for domestic crude in 1950, with 3.3 percent of the total in 1950 compared with 3.5 percent in 1949. The total market demand for Illinois crude declined from 65.3 million barrels in 1949 to 64.6 million in 1950, or 1.0 percent. Stocks of Illinois crude decreased 2.8 million barrels in 1950. Total deliveries of Illinois crude to refineries amounted to 62.1 million barrels in 1950, including 26.8 million to refineries in the State and 35.3 million to those in other States. Deliveries to other States included in the Indiana-Illinois refinery district totaled 17.4 million barrels, and deliveries to the Appalachian refineries amounted to 17.9 million.

Wyoming ranked seventh in 1950 as a source of domestic crude, supplying 3.2 percent of the total market demand compared with 2.6 percent in 1949. The market demand for Wyoming crude rose from 47.4 million barrels in 1949 to 62.4 million in 1950, a gain of 31.8 percent. Deliveries of crude to refineries in 1950 amounted to 61.3 million barrels, including 25.4 million to refineries in the State and 35.9 million to other States. Deliveries to other States in the Mountain district were 15.5 million barrels, to the Indiana-Illinois district 16.7 million, to the Oklahoma-Kansas district 2.5 million, and to Washington 1.2 million.

New Mexico ranked eighth in the demand for domestic crude in 1950, furnishing 2.5 percent of the total in 1950 compared with 2.6 percent in 1949. The market demand for New Mexico crude increased from 47.1 million barrels in 1949 to 49.1 million in 1950, a gain of 4.3 percent. Stocks of New Mexico crude decreased 1.1 million barrels in 1950. Deliveries of New Mexico crude to refineries totaled 48.6 million barrels in 1950, including 4.0 million to refineries in the State and 44.6 million to other States. Deliveries to other States included 28.6 million barrels to Texas, 13.5 million to the Indiana-Illinois district, 1.3 million to the East Coast district, and 1.2 million to Oklahoma.

STOCKS

The most significant factor in the stocks of all oils in the past 3 years relates to product stocks. The abnormal increase of almost 80 million barrels in product stocks in 1948 and the decline of less than 1 million barrels in these stocks in 1949 left a total on hand at the start of 1950 that led to a curtailment of refinery operations and an unusually heavy liquidation of product stocks during the first half of the year. With total civilian demand for all oils much higher than had been anticipated and increasing military requirements, every effort was made to increase refinery operations and raise the level of product stocks in the last half of 1950.

Total stocks of all oils declined from 603.1 million barrels at the beginning of 1950 to 582.7 million at the end of the year. The decrease of 20.4 million barrels included a decline of 4.9 million in crude stocks, an increase of 0.5 million in natural-gasoline stocks, and a decline of 16.0 million in product stocks, representing primarily a decrease in residual fuel stocks in California.

The decline in crude stocks in 1950 included a decline of 6.2 million in stocks of domestic crude and an increase of 1.3 million barrels in stocks of foreign crude. The principal changes in domestic crude stocks by States of origin were declines of 6.7 million barrels for California, 2.8 million for Illinois, 2.0 million for Wyoming, and 1.1 million for New Mexico. The largest increases were 7.0 million barrels for Texas and 1.5 million for Kansas.

TABLE 42.—Stocks of crude petroleum, natural gasoline, and refined products in continental United States at end of year, 1946–50

[Thousands of barrels]

Product	1946	1947	1948	1949 [1]	1950 [1]
Crude petroleum (refinable):					
At refineries	53,113	52,864	60,969	60,405	63,328
Pipeline and tank-farm	156,238	156,726	169,508	177,049	167,941
Producers	15,122	15,339	16,095	15,902	17,194
Total refinable	224,473	224,929	246,572	253,356	248,463
California heavy crude	5,703	5,725	10,055		
Total crude petroleum	230,176	230,654	256,627	253,356	248,463
Natural gasoline, etc	4,981	4,296	5,579	6,831	7,355
Refined products	271,937	267,103 [2] 265,850	345,650 [2] 343,537	342,704 [2] 342,932	326,892
Grand total	507,094	502,053 [2] 500,800	607,856 [2] 605,743	602,891 [2] 603,119	582,710

[1] Final figures. Separation between "gasoline-bearing" and "heavy" in California discontinued in 1949.
[2] New basis, for comparison with subsequent years.

TABLE 43.—Stocks of crude petroleum in continental United States in 1950, by States of origin and months [1]

[Thousands of barrels]

State of origin	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Alabama	21	42	41	20	28	26	33	29	58	57	68	68	92
Arkansas	3, 190	3, 209	3, 038	3, 053	2, 809	2, 544	2, 613	2, 599	2, 508	2, 652	2, 422	2, 236	2, 268
California	37, 941	37, 206	37, 280	37, 564	36, 553	35, 627	34, 516	33, 593	31, 646	30, 652	30, 275	30, 058	31, 240
Colorado	1, 916	1, 812	1, 758	1, 722	1, 821	1, 820	1, 873	1, 710	1, 836	1, 910	1, 743	1, 634	1, 555
Florida	168	159	137	158	135	137	180	210	157	86	128	135	121
Illinois	11, 964	11, 089	10, 461	10, 697	9, 303	8, 766	8, 624	9, 035	8, 932	8, 881	8, 866	9, 317	9, 197
Indiana	189	158	203	283	281	260	264	209	245	245	275	232	283
Kansas	8, 603	8, 434	8, 913	9, 109	9, 355	8, 655	9, 403	9, 133	8, 578	8, 807	9, 678	10, 033	10, 132
Kentucky	1, 550	1, 497	1, 443	1, 456	1, 401	1, 310	1, 371	1, 357	1, 306	1, 345	1, 259	1, 140	1, 359
Louisiana	14, 791	15, 557	16, 591	16, 205	16, 403	16, 441	16, 991	16, 209	15, 986	15, 245	15, 489	15, 317	14, 229
Michigan	1, 056	885	817	830	787	778	1, 079	809	770	684	789	744	643
Mississippi	2, 122	2, 202	2, 204	2, 533	2, 282	2, 048	2, 168	2, 338	2, 287	2, 446	2, 156	2, 581	2, 668
Missouri, Nebraska, Utah	64	65	74	60	89	86	92	125	84	75	62	67	74
Montana	1, 151	1, 066	1, 027	989	1, 111	1, 223	1, 225	1, 197	1, 115	1, 153	1, 351	1, 322	1, 270
New Mexico	7, 518	7, 299	6, 822	6, 425	5, 782	4, 945	4, 646	5, 185	5, 323	6, 150	6, 662	6, 194	6, 449
New York	179	167	227	217	227	245	301	339	296	276	242	224	197
Ohio	731	638	617	644	734	847	892	829	843	864	936	824	763
Oklahoma	28, 466	27, 329	26, 714	25, 600	26, 482	25, 551	24, 753	23, 494	25, 001	26, 497	27, 864	27, 820	28, 549
Pennsylvania	1, 808	1, 761	1, 669	1, 745	1, 622	1, 598	1, 639	1, 574	1, 537	1, 289	1, 215	1, 221	1, 176
Texas	111, 372	107, 292	105, 859	103, 908	107, 983	108, 400	111, 882	112, 652	113, 118	117, 548	117, 772	121, 270	118, 389
West Virginia	509	528	528	525	559	582	571	506	474	471	460	445	425
Wyoming	10, 955	10, 747	10, 625	10, 957	10, 842	10, 754	9, 785	9, 107	8, 158	8, 129	9, 119	9, 249	8, 995
Total domestic	246, 264	239, 142	237, 048	234, 700	236, 589	232, 643	234, 901	232, 239	230, 258	235, 462	238, 831	242, 131	240, 074
Foreign	7, 092	7, 468	6, 702	6, 530	8, 016	7, 234	7, 386	8, 031	7, 135	6, 849	7, 593	7, 394	8, 389
Grand total	253, 356	246, 610	243, 750	241, 230	244, 605	239, 877	242, 287	240, 270	237, 393	242, 311	246, 424	249, 525	248, 463
Pennsylvania Grade (included above)	2, 813	2, 734	2, 666	2, 788	2, 765	2, 835	2, 983	2, 849	2, 730	2, 470	2, 347	2, 273	2, 134

[1] Preliminary figures.

TABLE 44.—Stocks of crude petroleum in continental United States in 1950, by location and months[1]

[Thousands of barrels]

State	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Arkansas	2,708	2,688	2,541	2,545	2,346	2,240	2,289	2,219	2,165	2,069	1,933	1,986	2,138
California, Washington	38,027	37,321	37,342	37,658	36,579	35,699	34,585	33,640	31,734	30,699	30,358	30,095	31,240
Colorado	815	759	659	746	835	843	828	771	669	633	803	762	721
Georgia, Delaware, Florida, South Carolina, Virginia	327	409	425	381	414	350	470	563	459	472	360	358	336
Illinois, Minnesota, Wisconsin	15,388	14,874	14,701	15,055	15,682	16,258	16,274	16,524	17,007	17,414	16,711	16,249	16,811
Indiana	3,504	3,888	3,758	4,106	4,418	3,981	3,771	3,738	3,876	3,859	4,409	4,250	4,534
Kansas, Nebraska	9,944	9,670	9,967	10,207	9,958	9,790	9,888	10,631	9,797	9,977	10,552	10,467	10,052
Kentucky, Tennessee	2,441	2,188	2,156	2,031	2,367	1,914	1,978	2,105	1,857	1,863	1,936	2,306	2,151
Louisiana, Alabama	13,001	13,533	13,754	13,282	13,523	12,928	13,413	13,511	13,446	13,711	13,397	13,561	12,895
Maryland	901	731	694	785	1,088	877	1,286	1,243	1,068	947	1,364	1,047	1,043
Massachusetts, Rhode Island	574	743	637	903	791	742	838	617	545	821	547	695	699
Michigan	1,515	1,298	1,232	1,226	1,329	1,331	1,405	1,259	1,224	1,189	1,302	1,300	1,604
Mississippi	1,037	1,067	1,089	1,103	1,024	1,213	1,394	1,160	1,035	970	886	1,181	1,130
Missouri, Iowa	5,925	5,847	5,949	6,022	6,259	6,168	6,180	6,124	6,113	6,004	6,152	6,183	6,339
Montana	1,780	1,735	1,575	1,515	1,792	1,915	1,851	1,776	1,696	1.638	2,031	1,815	1,742
New Jersey	7,161	6,663	5,678	6,636	6,582	6,620	6,324	6,813	6,043	5,546	6,553	6,227	7.043
New Mexico	2,054	2,052	1,799	1,908	1,974	1.731	1,794	1,678	1,518	1,901	1,725	1,765	1,689
New York	852	1,081	1,019	1,036	1,020	951	1,163	1,295	1,278	1,219	1,332	1,431	1,201
Ohio	7,123	6,728	6,880	5,827	5,277	5,398	4,987	4,078	4,113	4,602	5,631	6,644	7.407
Oklahoma	27,537	25,325	24,122	23,004	23,531	23,396	23,348	23,770	24,881	27,121	28,601	29,167	28,493
Pennsylvania	7,695	8,439	7,440	6,783	8,483	8,149	8,645	8,681	7.760	7,695	7,642	8,202	7,888
Texas	93,049	89,843	90,608	88,526	89,627	87,952	90,746	89,962	91,703	94,695	94,786	96,419	93,516
Utah	581	575	572	637	580	612	636	586	491	644	536	542	542
West Virginia	664	654	650	702	715	709	786	668	605	568	555	522	583
Wyoming, Idaho	8,753	8,499	8,503	8,474	8,304	8,110	7,408	6,858	6,307	6,054	6,322	6,351	6,666
Total	253,356	246,610	243,750	241,098	244,498	239,877	242,287	240,270	237,393	242,311	246,424	249,525	248,463

[1] Preliminary figures.

TABLE 45.—Stocks of crude petroleum in continental United States in 1950, by classification and location

[Thousands of barrels]

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
At refineries:													
Arkansas	670	655	525	575	458	367	483	418	432	417	364	364	550
California, Washington	10,551	10,566	10,256	10,385	9,795	9,798	9,187	9,631	8,948	9,098	9,313	8,627	9,645
Colorado	265	213	134	249	271	298	251	192	175	197	291	253	221
Georgia, Delaware, South Carolina	321	403	420	375	407	341	418	464	420	386	337	282	215
Illinois, Minnesota, Wisconsin	3,360	3,403	3,369	3,530	3,916	4,272	4,542	4,170	4,893	4,097	3,767	3,557	4,172
Indiana	1,502	1,652	1,740	1,875	1,940	1,648	1,689	1,629	1,635	1,765	1,938	1,722	1,820
Kansas, Nebraska	1,943	2,068	2,294	2,473	2,300	1,961	2,018	1,977	1,793	1,728	2,082	2,440	2,253
Kentucky, Tennessee	1,179	975	926	836	1,152	919	1,061	1,104	972	981	1,099	1,028	991
Louisiana	3,510	3,822	3,984	3,972	4,104	3,873	4,131	4,303	4,311	4,350	3,850	4,028	3,823
Maryland	901	731	694	785	1,088	877	1,286	1,243	1,068	947	1,364	1,047	1,043
Massachusetts, Rhode Island	574	743	637	903	791	742	838	617	545	821	547	695	699
Michigan	398	289	243	210	344	345	426	370	446	461	552	485	767
Mississippi	11	10	10	9	10	12	12	12	11	14	13	12	12
Missouri	196	199	222	196	213	199	211	231	232	204	219	210	218
Montana	891	877	799	752	881	1,013	982	894	817	770	1,140	923	868
New Jersey	6,693	6,227	5,238	6,324	6,213	6,196	5,923	6,523	5,823	5,353	6,379	6,104	6,912
New Mexico	79	71	62	83	91	79	80	85	73	72	78	81	83
New York	635	881	761	812	753	702	899	1,031	1,117	1,019	1,196	1,219	984
Ohio	1,079	931	1,314	918	1,106	1,096	1,201	1,066	1,039	1,048	1,137	1,212	1,481
Oklahoma	2,665	2,642	2,589	2,816	2,702	2,883	2,999	2,915	2,890	3,072	3,143	3,076	3,146
Pennsylvania	5,831	6,563	5,608	4,957	6,624	6,050	6,729	6,830	5,817	6,090	6,147	6,680	6,244
Texas	15,773	15,971	16,822	16,126	15,968	17,698	16,820	15,751	16,376	16,547	15,668	15,601	15,781
Utah	451	446	444	509	452	484	506	361	365	512	404	412	412
West Virginia	29	35	39	49	31	32	38	35	40	39	38	27	31
Wyoming, Idaho	898	822	885	928	1,037	1,059	909	993	1,009	896	927	968	957
Total at refineries	60,405	61,195	59,965	60,647	62,647	62,944	63,639	62,845	61,247	60,884	61,993	61,053	63,328
Pipeline and tank-farm stocks:													
Arkansas	1,668	1,648	1,641	1,595	1,508	1,498	1,436	1,411	1,358	1,272	1,189	1,247	1,213
California	23,404	22,671	23,159	23,876	22,778	21,965	21,505	19,902	18,459	17,244	16,769	17,004	17,152
Colorado	385	386	370	357	419	390	427	424	349	286	372	374	380
Illinois	11,438	10,856	10,707	10,945	11,141	11,401	11,152	11,749	11,544	12,727	12,369	12,107	12,034
Indiana	1,942	2,171	1,948	2,166	2,413	2,268	2.017	2,044	2,181	2,034	2,406	2,458	2,644
Kansas, Nebraska	6,971	6,572	6,728	6,719	6,598	6,774	6,880	7,249	6,994	7,264	7,440	7,047	6,814
Kentucky, Tennessee	1,202	1,153	1,170	1,135	1,155	935	857	941	825	822	772	1,208	1,090
Louisiana, Alabama	8,289	8,394	8,438	7,953	7,997	7,673	7,954	7,844	7,714	7,901	8,057	8,069	7,654
Michigan	922	809	789	816	780	791	789	689	593	538	560	625	642
Mississippi	621	677	714	689	594	806	987	758	649	561	493	769	753
Missouri, Iowa	5,729	5,648	5,727	5,826	6,046	5,969	5,969	5,893	5,881	5,800	5,933	5,973	6,121
Montana	704	648	586	573	716	722	694	692	699	683	711	712	689
New Jersey, Florida	468	436	440	444	369	424	444	379	249	268	188	184	239
New Mexico	1,410	1,406	1,167	1,240	1,288	1,057	1,134	1,008	865	1,259	1,077	1,114	1,001

TABLE 45.—Stocks of crude petroleum in continental United States in 1950, by classification and location—Continued

[Thousands of barrels]

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Pipeline and tank-farm stocks—Con.													
New York	187	170	228	194	237	219	234	234	131	170	106	182	187
Ohio	5, 954	5, 707	5, 476	4, 819	4, 081	4, 212	3, 696	2, 917	2, 984	3, 464	4, 404	5, 342	5, 836
Oklahoma	23, 662	21, 388	20, 268	18, 903	19, 504	19, 243	19, 109	19, 565	20, 771	22, 794	24, 188	24, 836	24, 062
Pennsylvania	1, 704	1, 706	1, 662	1, 666	1, 694	1, 939	1, 761	1, 691	1, 788	1, 445	1, 335	1, 357	1, 474
Texas	72, 386	68, 982	68, 926	67, 575	68, 631	65, 249	68, 731	68, 786	69, 972	72, 613	73, 733	75, 393	72, 210
Utah	123	123	123	123	123	123	123	220	123	126	126	124	125
West Virginia	475	454	446	488	514	512	583	468	400	364	357	330	387
Wyoming	7, 410	7, 212	7, 203	7, 061	6, 787	6, 581	6, 024	5, 390	4, 828	4, 668	4, 905	4, 888	5, 234
Total pipeline and tank-farm stocks	177, 049	169, 217	167, 916	164, 663	165, 373	160, 751	162, 506	160, 254	159, 357	164, 303	167, 490	171, 343	167, 941
Producers' stocks	15, 902	16, 198	15, 869	15, 920	16, 585	16, 182	16, 142	17, 171	16, 789	17, 124	16, 941	17, 129	17, 194
Grand total: 1950 [1]	253, 356	246, 610	243, 750	241, 230	244, 605	239, 877	242, 287	240, 270	237, 393	242, 311	246, 424	249, 525	248, 463
1949	256, 627	258, 648	265, 216	269, 341	272, 520	273, 912	274, 691	267, 586	260, 585	251, 689	250, 809	256, 010	253, 356

[1] Preliminary figures.

PRICES AND VALUE

The average value of crude petroleum at the well, as reported in the annual survey of the Bureau of Mines, rose from $1.41 per barrel in 1946 to $1.93 in 1947 and to $2.60 in 1948. The results of the 1949 survey show a decline in average value to $2.54 per barrel. The figures for 1950 indicate an average value of $2.51 per barrel.

The value of crude at wells totaled $5,245 million in 1948 and declined to $4,675 million in 1949, as a result of an 8.8-percent decrease in volume and a 6-cent-per-barrel decrease in average value at the well. With an increase of 7.1 percent in the volume of production, the total value in 1950 was $4,959 million.

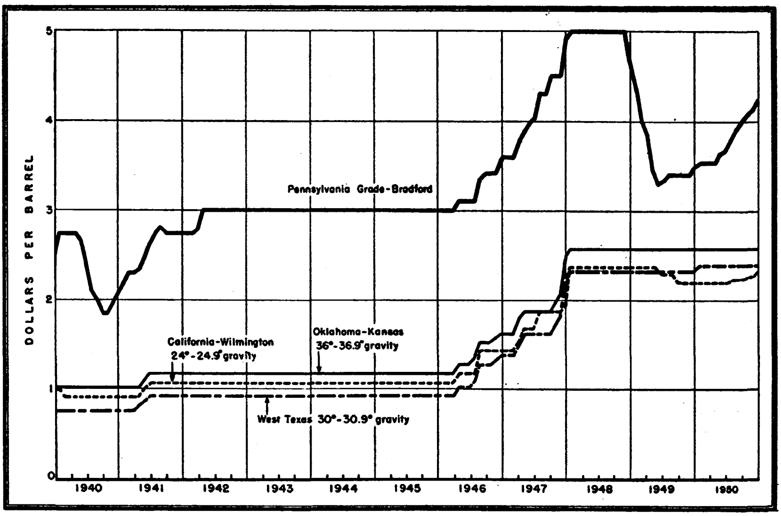

FIGURE 5.—Posted prices of selected grades of crude petroleum in the United States, 1940–50, by months.

The average value of crude at the well varies considerably with the quality of the oil and the distance from the market. The highest-value crudes, due to their high content of lubricating oils, are those in the Appalachian district. The value of crude from the Illinois Basin is well above the national average because of quality and nearness to refinery and product markets. The value of Oklahoma and Kansas crude generally closely approximates the national average, good quality being somewhat offset by longer distances to market. The average value of Texas crude approximates the national average but includes a wide range of values owing to variations in quality and location.

The posted prices for the Bradford and Alleghany districts illustrate the trend for Pennsylvania Grade crudes. The improved demand for lubricating oils in 1950 resulted in a steady upward trend in the posted prices for crude in these districts that more than offset the average decline in 1949. The posted prices for this grade were $4.50 per barrel on January 1, 1949, declined to a low of $3.27 on May 11, rose to $3.54 on December 12, and remained there until May 1, 1950, when they rose to $3.65. Subsequent increases were to $3.75 per barrel on June 21, $3.89 on July 19, $4.00 on August 25, $4.10 on October 9, and $4.25 on December 9, 1950.

There were no changes during 1950 in the representative posted prices shown for all other districts except California, where the posted price for Coalinga crude rose from $2.58 per barrel on January 1 to $2.61 on December 12, Kettleman crude rose from $2.77 on January 1 to $2.80 on December 12, Midway-Sunset crude increased progressively from $1.65 per barrel on January 1 to $2.00 on December 12, and Wilmington crude rose from $2.20 on January 1 to $2.33 by December 12.

TABLE 46.—Value at wells of crude petroleum produced in the United States, 1948–50, by States

State	1948		1949		1950 [1]	
	Total (thousands of dollars)	Average per barrel	Total (thousands of dollars)	Average per barrel	Total (thousands of dollars)	Average per barrel
Arkansas	78,570	$2.48	74,360	$2.48	76,530	$2.46
California	822,980	2.42	752,450	2.26	707,670	2.16
Colorado	45,730	2.56	60,150	2.55	59,550	2.55
Illinois	179,520	2.77	178,670	2.77	171,520	2.77
Indiana	19,320	2.77	26,860	2.77	27,440	2.76
Kansas	288,360	2.60	262,820	2.58	276,500	2.57
Kentucky	24,380	2.77	24,300	2.76	28,430	2.76
Louisiana:						
Gulf Coast	371,190	2.69	390,980	2.67	438,570	2.66
Northern	114,760	2.64	116,750	2.63	116,350	2.63
Total Louisiana	485,950	2.68	507,730	2.66	554,920	2.65
Michigan	48,250	2.86	45,420	2.75	42,690	2.70
Mississippi	110,280	2.41	93,400	2.46	88,380	2.31
Montana	24,210	2.58	23,520	2.58	20,440	2.52
Nebraska	520	2.43	730	2.21	3,290	2.13
New Mexico	117,520	2.45	116,250	2.44	116,640	2.43
New York	22,830	4.94	15,750	3.56	15,660	3.78
Ohio	15,190	4.22	10,200	2.93	10,100	3.03
Oklahoma	398,490	2.58	388,250	2.56	423,790	2.57
Pennsylvania	62,830	4.96	40,600	3.57	45,120	3.82
Texas:						
Gulf Coast	754,710	2.75	570,650	2.73	538,940	2.72
West Texas	676,160	2.46	564,800	2.46	711,520	2.48
East Texas proper	297,550	2.65	248,970	2.65	260,300	2.65
Other districts	628,980	2.60	547,630	2.58	634,590	2.58
Total Texas	2,357,400	2.61	1,932,050	2.59	2,145,350	2.59
West Virginia	12,810	4.76	8,770	3.09	9,280	3.33
Wyoming	128,230	2.33	109,190	2.28	130,590	2.16
Alabama, Florida, Missouri, Tennessee, Utah, Virginia	1,710	2.00	3,300	2.00	4,960	2.00
Grand total	5,245,080	2.60	4,674,770	2.54	4,958,850	2.51

[1] Preliminary figures.

TABLE 47.—Posted price per barrel of petroleum at wells in the United States in 1950, by grades, with dates of change

Date	Pennsylvania Grade		Corning Grade in Buckeye Pipe Line Co.[3]	Western Kentucky[3]	Illinois Basin[4]	Midland, Mich.[5]	Oklahoma-Kansas[6]	
	Bradford and Allegany districts[1]	In Southwest Pennsylvania pipelines[2]					34°-34.9°	36°-36.9°
Jan. 1	$3.54	$3.11	$2.70	$2.77	$2.77	$2.80	$2.53	$2.57
May 1	3.65	3.22						
June 21	3.75	3.32						
July 19	3.89	3.46						
Aug. 25	4.00	3.57						
Oct. 9	4.10	3.67						
Dec. 9	4.25	3.82						

Date	Panhandle Texas (Carson, Gray, Hutchinson, and Wheeler Counties), 35°-35.9°[7]	West Texas, 30°-30.9°[7]	Lea County, N. Mex. 30°-30.9°[7]	South Texas, Duval-Mirando, 24°-24.9°[7]	East Texas[7]	Gulf Coast			
						Conroe, Tex.[8]	Texas, 30°-30.9°[8]	Texas, 20°-20.9°[8]	Louisiana, 30°-30.9°[9]
Jan. 1	$2.55	$2.38	$2.38	$2.53	$2.65	$2.83	$2.60	$2.40	$2.55

Date	Rodessa, La., 36°-36.9°[9]	Smackover, Ark.[10]	Elk Basin, Wyo., 30°-30.9°[4]	Salt Creek, Wyo., 36°-36.9°[11]	California[12]			
					Coalinga, 32°-32.9°	Kettleman, 37°-37.9°	Midway-Sunset, 19°-19.9°	Wilmington, 24°-24.9°
Jan. 1	$2.57	$2.08	$2.14	$2.57	$2.58	$2.77	$1.65	$2.20
June 29							1.75	2.23
July 26							1.80	2.24
Oct. 17							1.86	2.26
Dec. 12					2.61	2.80	2.00	2.33

[1] The Tide Water Associated Oil Co.
[2] The South Penn Oil Co.
[3] Sohio Corp.
[4] The Ohio Oil Co.
[5] The Pure Oil Co.
[6] Standard Oil Co. (Indiana).
[7] Humble Oil & Refining Co.
[8] The Texas Co.
[9] Esso Standard Oil Co.
[10] Arkansas Fuel Oil Co.
[11] Stanolind Oil & Gas Co.
[12] Standard Oil Co. of California.

REFINED PRODUCTS

GENERAL REVIEW

The total demand for all oils[5] in 1950 averaged 6,803,000 barrels daily, an 11-percent gain over 1949. A considerable part of this relative increase is a consequence of the lagging demand in 1949, which was 0.5 percent below that of 1948. It is due, moreover, to the defense-mobilization activity of latter 1950 and to the more normal weather compared to the abnormally mild weather in 1949.

The supply of products was augmented in 1950 by an increase of 150.7 million barrels in crude runs (a gain of 7.7 percent), by an increase in the import of refined products of 49.6 million barrels (61 percent), and by a reduction of 16.0 million barrels in stocks of refined products, compared with a decline of 0.8 million during 1949.

[5] For definition, see footnote 1 at beginning of this chapter.

TABLE 48.—Runs to stills and output of petroleum products at refineries in the United States, 1946–50

[Thousands of barrels]

Product	1946	1947	1948	1948 [1]	1949	1950 [2]
Input:						
Crude petroleum:						
Domestic	1,645,845	1,754,987	1,907,027	1,924,335	1,789,756	1,918,854
Foreign	84,352	97,259	124,014	124,014	154,465	176,013
Total crude petroleum	1,730,197	1,852,246	2,031,041	2,048,349	1,944,221	2,094,867
Natural gasoline	62,861	70,692	76,237	76,218	85,457	94,639
Total input	1,793,058	1,922,938	2,107,278	2,124,567	2,029,678	2,189,506
Output:						
Gasoline	748,411	814,841	895,986	895,986	939,051	998,093
Kerosine	104,385	110,412	121,914	121,914	102,152	118,512
Distillate fuel oil	287,896	312,173	380,700	379,340	340,825	398,912
Residual fuel oil	431,364	447,795	466,317	479,988	424,909	425,217
Lubricants	45,645	51,765	51,416	51,416	45,389	51,735
Wax [3]	3,003	3,624	3,515	3,515	3,208	4,462
Coke [3]	10,621	12,077	14,494	14,494	16,959	17,224
Asphalt [3]	44,911	49,286	51,919	51,919	49,007	58,240
Road oil	6,175	7,074	7,915	7,916	7,691	6,928
Still gas [3]	88,136	85,564	81,159	81,159	82,621	83,743
Liquefied gases	15,440	18,670	23,676	23,676	23,469	29,083
Other finished products	7,099	5,678	6,929	6,929	4,236	4,717
Unfinished gasoline (net)	[4] 108	984	[4] 917	[4] 917	[4] 418	243
Other unfinished oils (net)	[4] 1,615	[4] 1,227	[4] 513	4,464	[4] 10,006	[4] 6,891
Shortage [5]	1,695	4,222	2,768	2,768	585	−712
Total output	1,793,058	1,922,938	2,107,278	2,124,567	2,029,678	2,189,506

[1] Includes California data on a new basis to compare with 1949.
[2] Preliminary figures.
[3] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[4] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[5] Includes losses or gains in volume during processing.

The 11-percent increase in the total demand for all oils (from 2,237.6 million barrels in 1949 to 2,483.1 million in 1950) included gains of about 7 percent for motor fuel, 12 percent for residual fuel oil, 19 percent for distillate fuel oil, 14 percent for kerosine, and 12 percent for all other products.

Exports of refined products declined from 86.3 million barrels in 1949 to 76.1 million in 1950, or about 12 percent. The principal changes in exports included a decrease of 14.8 million for motor fuel and gains of 3.6 million for residual fuel oil and 1.3 million barrels for lubricants. The continued drop in exports reflected expansion in refinery capacity abroad and the problem of dollar exchange.

The domestic demand for all products increased from 2,118.3 million barrels in 1949 to 2,372.2 million in 1950, or 12 percent. The demand for motor fuel was almost 9 percent higher, for residual fuel about 11.5 percent higher, for distillate fuel oil about 20 percent higher, for kerosine about 15 percent higher, and for other products about 13 percent higher.

The new supply of refined products is composed of refinery output from crude, the production of light products from natural gas, and imports of refined products.

The output of light products at natural-gasoline and cycle plants increased from 157.1 million barrels in 1949 to 181.6 million in 1950, a gain of about 16 percent. The amount of motor benzol from coke-oven operations that was blended with motor fuel was less than 0.2 million barrels in both years. The total amount of these liquid fuels from sources other than crude oil that was marketed or blended in

1950 was 181.2 million barrels, after allowance for a small increase in stocks. About 66.5 percent of the total in 1950 was used for motor fuel; about 31.9 percent, in the form of liquefied petroleum gases, went into other fuel and into chemical uses; and about 1.6 percent went into miscellaneous products.

Imports of refined products rose from 81.9 million barrels in 1949 to 131.4 million in 1950, a gain of about 60 percent. The principal change was the increase in imports of residual fuel oil from 75.2 million barrels in 1949 to 119.2 million in 1950, or almost 59 percent.

TABLE 49.—Salient statistics of the major refined petroleum products in continental United States, 1946–50

[Thousands of barrels]

Product	1946	1947	1948	1949	1950 [1]
Motor fuel:					
Production	776,583	839,998	921,923	962,417	1,024,448
Imports	1	358	302	----	156
Exports	45,334	47,449	37,302	39,347	24,516
Stocks, end of year	89,515	87,407	101,060	110,417	116,024
Domestic demand	735,417	795,015	871,270	913,713	994,481
Kerosine:					
Production	104,385	110,412	121,914	102,152	118,512
Imports	----	----	135	----	245
Exports	8,637	7,252	3,495	2,533	2,043
Stocks, end of year	17,081	17,722	[2] 23,941	20,888	19,723
Domestic demand	89,088	102,519	112,220	102,672	117,879
Distillate fuel oil:					
Production	287,896	312,173	380,700	340,825	398,912
Transfers from crude	3,123	3,263	3,543	2,701	2,537
Imports	5,204	4,175	2,546	1,825	2,340
Exports	29,487	29,877	21,293	12,295	12,561
Stocks, end of year	59,620	51,081	[2] 71,429	[3] 75,435	71,948
Domestic demand	242,894	298,273	340,576	329,278	394,715
Residual fuel oil:					
Production	431,364	447,795	466,317	424,909	425,217
Transfers from crude	23,142	27,091	23,847	4,750	5,325
Imports	44,647	54,244	53,269	75,175	119,186
Exports	9,188	10,623	13,011	12,641	16,227
Stocks, end of year	47,094	47,091	[2] 64,021	60,193	40,750
Domestic demand	480,029	518,510	500,543	496,021	552,944
Lubricants:					
Production	45,645	51,765	51,416	45,389	51,735
Imports	88	38	101	----	----
Exports: Grease	----	----	[4] 396	[4] 392	[4] 382
Exports: Oil	11,051	14,262	12,996	12,520	13,847
Stocks, end of year	7,564	[5] 7,701	9,843	9,219	7,849
Domestic demand	34,891	36,481	35,983	33,101	38,876
Wax (1 barrel=280 pounds):					
Production	3,003	3,624	3,515	3,208	4,462
Imports	1	4	27	----	----
Exports	718	1,107	994	1,031	1,195
Stocks, end of year	308	351	551	473	504
Domestic demand	2,271	2,478	2,348	2,255	3,236
Coke (5 barrels=1 short ton):					
Production	10,621	12,077	14,494	16,959	17,224
Exports	1,933	2,102	2,521	2,480	2,494
Stocks, end of year	450	343	646	698	408
Domestic demand	9,029	10,082	11,670	14,427	15,020
Asphalt (5.5 barrels=1 short ton):					
Production	44,911	49,286	51,919	49,007	58,240
Imports	691	1,159	1,557	1,185	1,795
Exports	2,298	3,262	1,628	1,569	982
Stocks, end of year	3,861	[5] 3,771	5,657	4,918	5,293
Domestic demand	43,253	47,023	49,962	49,362	58,678

For footnotes, see end of table.

TABLE 49.—**Salient statistics of the major refined petroleum products in continental United States, 1946–50—Continued**

[Thousands of barrels

Product	1946	1947	1948	1949	1950 [1]
Road oil:					
Production	6,175	7,074	7,915	7,691	6,928
Stocks, end of year	606	613	501	366	397
Domestic demand	5,939	7,067	8,027	7,826	6,897
Still gas (1 barrel=3,600 cubic feet):					
Production	88,136	85,564	81,159	82,621	83,743
Liquefied gases:					
Production (liquefied refinery gases)	15,440	18,670	23,676	23,469	29,083
Transfers of liquefied gas from natural-gasoline plants	25,515	35,310	42,991	45,982	57,795
Exports	1,166	1,266	1,089	1,279	1,631
Stocks, end of year	570	523	593	527	657
Domestic demand	39,667	52,761	65,508	68,238	85,117
Miscellaneous:					
Production	7,099	5,678	6,929	4,236	4,717
Exports	875	922	[4] 213	[4] 220	[4] 250
Stocks, end of year	550	[5] 504	714	735	808
Domestic demand	6,287	4,722	6,506	3,995	4,394
Unfinished gasoline:					
Rerun (net)	108	[6] 984	917	418	[6] 243
Stocks, end of year	8,208	9,192	8,275	7,857	8,100
Other unfinished oils:					
Rerun (net)	1,615	1,227	513	10,006	6,891
Transfers of cycle products [7]	1,261	1,704	1,914	2,470	2,927
Imports	978	1,879	1,114	3,688	7,713
Stocks, end of year	41,491	43,847	[2] 61,885	58,037	61,786
Shortage	1,695	4,222	2,768	585	−712

[1] Preliminary figures.
[2] Figure on new basis due to transfers in California of stock formerly reported as distillate and residual fuel oils to "Other unfinished oils," and excludes the following quantities from distributors' stocks: Kerosine, 115; distillate fuel oil, 1,469; residual fuel oil, 529. Figures for 1948 on the old basis and comparable with preceding years are as follows: Kerosine, 24,056; distillate fuel oil, 76,001; residual fuel oil, 76,970; other unfinished oils, 46,362.
[3] Figure on new basis due to additional terminal storage reported in the East Coast. Figure on old basis, 75,207.
[4] Beginning with January 1948, exports of grease were transferred from "Miscellaneous" to "Lubricants."
[5] Figure on new basis that excludes distributors' stocks in California and is comparable with subsequent years. Figures for 1947 on the old basis and comparable with preceding years are as follows: Lubricants, 8,624; asphalt, 4,021; miscellaneous, 584.
[6] Negative quantity; represents net excess of unfinished oils produced over unfinished oils rerun.
[7] Products from natural gasoline plants added to unfinished oil stocks.

Imports of unfinished oils for further refining rose from 3.7 million barrels in 1949 to 7.7 million in 1950. Imports of residual fuel oil represented about 92 percent of total refined imports in 1949 and 91 percent in 1950.

Total crude run to stills set a new record in 1950, increasing from 1,944.2 million barrels in 1949 to 2,094.9 million in 1950, a gain of 7.7 percent. The average for 1950 was 5,739,000 barrels daily, including a sharp rise from 5,422,000 barrels daily in the first half of the year to 6,052,000 barrels daily in the last half.

The yields of the principal refined products from crude, compared with 1949, showed a decline in gasoline yield from 43.7 percent to 43.0, a sharp decline in residual yield from 21.7 percent to 20.2, an increase in distillate yield from 17.5 percent to 19.0, and a gain in kerosine yield from 5.2 percent to 5.6. The relative gains in the yields of light fuels reflected the stronger market for these products, while the decline in residual yield was due to the fact that the increased demand was met by larger imports and a heavy reduction in stocks.

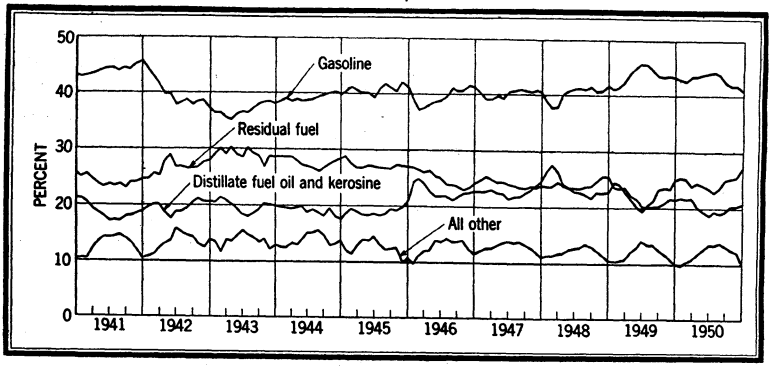

FIGURE 6.—Yields of principal products from crude run to stills in the United States, 1941–50, by months.

TABLE 50.—Percentage yields of refined petroleum products in the United States, 1941–50

Product	1941	1942	1943	1944	1945	1946	1947	1948	1948 [1]	1949	1950 [2]
Finished products:											
Gasoline:											
Cracked	24.4	22.3	22.0	23.2	23.3	22.5	(3)	(3)	(3)	(3)	(3)
Straight run	19.8	17.5	15.1	16.2	17.6	17.1	(3)	(3)	(3)	(3)	(3)
Total gasoline	44.2	39.8	37.1	39.4	40.9	39.6	40.2	40.3	40.1	43.7	43.0
Kerosine	5.2	5.1	5.0	4.7	4.7	6.0	6.0	6.0	6.0	5.2	5.6
Distillate fuel oil	13.4	14.7	14.8	14.4	14.5	16.6	16.8	18.7	18.5	17.5	19.0
Residual fuel oil	24.3	26.9	29.2	27.7	27.3	24.9	24.1	23.0	23.5	21.7	20.2
Lubricating oil	2.8	2.9	2.7	2.5	2.4	2.7	2.8	2.5	2.5	2.3	2.5
Wax	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2
Coke	.6	.5	.5	.5	.6	.6	.7	.7	.7	.9	.8
Asphalt	2.6	2.6	2.6	2.3	2.3	2.6	2.7	2.6	2.5	2.5	2.8
Road oil	.6	.6	.2	.1	.2	.4	.4	.4	.4	.4	.3
Still gas	5.9	5.9	6.1	6.1	6.0	5.1	4.6	4.0	4.0	4.2	4.0
Other	.4	.6	.7	1.1	1.1	1.3	1.3	1.5	1.5	1.4	1.6
Unfinished products (net):											
Gasoline	.1	.1	(4)	.1	[5] .3	(4 5)	(6)	(6)	(6)	(6)	(6)
Other	[5] .2	[5] .3	.2	.1	[5] .3	[5] .1	(7)	(7)	(7)	(7)	(7)
Shortage	[5] .1	.4	.7	.8	.4	.1	.2	.1	.1	------	------
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Yields computed on the new basis for California to compare with 1949.
[2] Preliminary figures.
[3] Not separated after 1946.
[4] Less than 0.1 percent.
[5] Negative percentage; represents excess rerun over produced.
[6] Added to finished gasoline production in computing yields after 1946.
[7] Added to crude in computing yields after 1946.

Total stocks of refined products amounted to 342.9 million barrels on January 1, 1950, and 326.9 million on December 31, 1950—a decline of 16.0 million barrels, including a decline of 21.2 million in the California district and a gain of 5.2 million in other districts. The changes in total refined stocks, by quarters, were a decline of 40.8 million barrels in the first quarter, gains of 6.4 million in the second quarter and 25.7 million in the third quarter, and a decline of 7.3 million barrels in the fourth quarter.

The major change in refined stocks during 1950 was the decrease of 19.4 million barrels in residual-fuel-oil stocks, including a decline of 17.4 million in the California district and a decline of 2.0 million in other districts. Stocks of finished gasoline increased 5.1 million barrels, including a decline of 2.6 million in the California district and a gain of 7.7 million in other districts. Stocks of distillate fuel oil decreased 3.5 million barrels, with a decline of 1.9 million in the California district and of 1.6 million in other districts. Stocks of kerosine were reduced 1.2 million barrels, including a decline of 0.2 million in California and of 1.0 million in other districts. Stocks of all other products increased 3.0 million barrels, with gains of 0.5 million in California and 2.4 million in other districts.

The prices of certain representative products in specified markets have been shown in the Minerals Yearbook over a series of years as a general indication of price trends. Prices vary in different districts, depending on the distance the crude moves to the refinery and the subsequent movements of products to market by boat, tank car, or pipeline.

The average price per gallon of Regular Grade gasoline at Oklahoma refineries was 11.9 cents in 1948, declined to 10.15 cents in 1949, and rose to 10.32 cents in 1950. The average tank-wagon price per gallon of kerosine at Chicago was 15.85 cents in 1948, declined to 15.33 cents in 1949, and rose to 15.36 cents in 1950. The average value per gallon of a selected bright stock at Oklahoma refineries was 31.67 cents in 1948, declined to 19.43 cents in 1949, and rose to 21.21 cents in 1950.

The average price of Bunker "C" oil at New York Harbor was $3.00 per barrel in 1948, declined to $1.90 in 1949, and rose to $2.09 in 1950.

The price per gallon of No. 2 distillate heating oil at New York was 9.71 cents in 1948, declined to 8.17 cents in 1949, and rose to 8.35 cents in 1950.

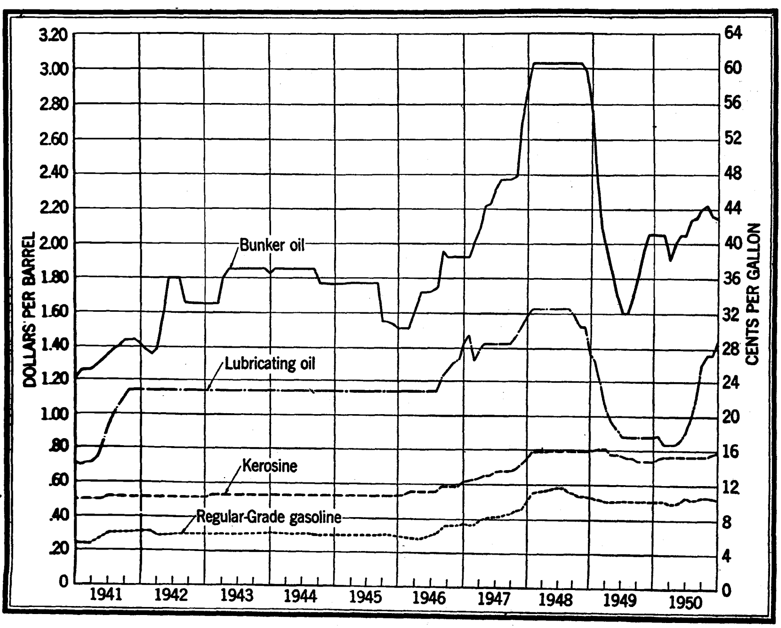

FIGURE 7.—Prices of Bunker "C" oil at New York Harbor, bright stock at Oklahoma refineries, tank-wagon prices of kerosine at Chicago, and Regular Grade gasoline at refineries in Oklahoma, 1941–50, by months.

TABLE 51.—Stocks of refined petroleum products in continental United States, 1949–50, by months

[Thousands of barrels]

Product	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
1949												
Gasoline	108, 544	117, 496	118, 822	117, 020	113, 164	106, 068	103, 867	97, 724	94, 445	96, 194	97, 173	103, 586
Kerosine	21, 261	18, 953	17, 801	19, 052	21, 546	23, 648	24, 826	25, 490	26, 650	27, 609	25, 267	20, 888
Distillate fuel oil	61, 729	53, 937	48, 923	51, 231	58, 381	64, 730	71, 553	76, 037	83, 213	90, 643	88, 212	[1] 75, 435
Residual fuel oil	62, 585	59, 398	58, 190	59, 668	63, 576	64, 628	66, 084	66, 843	67, 117	68, 673	65, 112	60, 193
Lubricating oil	10, 326	10, 856	10, 931	10, 588	10, 089	9, 922	9, 731	8, 962	8, 734	8, 894	9, 109	9, 219
Wax	542	495	488	481	502	531	530	499	447	465	450	473
Coke	771	790	870	990	1, 136	1, 142	1, 203	1, 249	1, 180	1, 085	802	698
Asphalt	6, 733	7, 433	7, 952	8, 305	8, 250	7, 447	6, 859	5, 746	4, 565	4, 391	4, 347	4, 918
Road oil	484	561	610	827	876	881	776	579	529	441	433	366
LR-gases	569	572	619	783	733	648	668	647	568	582	500	527
Miscellaneous	742	756	688	720	782	835	786	746	693	673	739	735
Unfinished gasoline	8, 394	8, 558	8, 621	8, 331	8, 438	7, 973	7, 350	7, 155	7, 354	7, 093	7, 534	7, 857
Other unfinished oils	61, 003	62, 240	63, 583	62, 910	62, 259	64, 536	65, 002	64, 087	64, 009	62, 170	59, 367	58, 037
Total 1949	343, 683	342, 045	338, 098	340, 906	349, 732	352, 989	359, 235	355, 764	359, 504	368, 913	359, 045	[1] 342, 932
1950												
Gasoline	116, 624	124, 177	124, 924	119, 584	112, 915	106, 026	102, 769	99, 423	97, 904	97, 844	100, 995	108, 669
Kerosine	18, 260	16, 126	13, 001	13, 383	17, 304	21, 117	23, 151	25, 803	27, 677	28, 292	25, 526	19, 723
Distillate fuel oil	63, 932	52, 206	37, 777	37, 530	42, 739	53, 679	61, 664	68, 426	78, 270	85, 643	86, 113	71, 948
Residual fuel oil	55, 808	47, 828	41, 860	39, 979	39, 482	40, 124	42, 165	40, 979	41, 966	45, 004	45, 048	40, 750
Lubricating oil	9, 323	9, 341	8, 989	8, 787	8, 280	7, 736	7, 427	7, 145	6, 950	6, 973	7, 283	7, 849
Wax	478	517	492	500	542	566	577	542	521	483	485	504
Coke	745	774	500	584	664	644	624	505	521	424	369	408
Asphalt	5, 653	6, 270	6, 813	7, 206	7, 144	6, 354	5, 783	4, 345	4, 083	3, 686	4, 320	5, 293
Road oil	436	502	479	670	834	740	698	475	468	418	373	397
LR-gases	571	537	579	697	684	640	666	666	619	619	694	657
Miscellaneous	692	651	626	669	655	666	683	656	599	601	651	808
Unfinished gasoline	8, 674	8, 619	8, 842	8, 473	8, 120	8, 048	8, 286	7, 644	7, 844	7, 920	8, 010	8, 100
Other unfinished oils	57, 288	55, 422	57, 191	58, 002	60, 902	62, 217	63, 983	66, 123	66, 798	65, 609	65, 911	61, 786
Total 1950	338, 484	322, 970	302, 133	296, 154	300, 265	308, 557	318, 476	322, 732	334, 220	343, 516	345, 778	326, 892

[1] New basis, for comparison with 1950; includes an additional 228,000 barrels of distillate fuel oil in terminal storage on the east coast.

TABLE 52.—Runs to stills and output of petroleum products at refineries in the United States, 1949–50, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Input:													
Crude petroleum	175, 295	153, 440	165, 919	154, 223	161, 053	154, 539	160, 088	162, 162	162, 429	166, 568	158, 782	169, 723	1, 944, 221
Natural gasoline	6, 497	6. 314	6, 577	6, 399	7, 241	7, 296	7, 269	7, 319	7, 470	8, 301	7, 449	7, 325	85, 457
Total output	181, 792	159, 754	172, 496	160, 622	168, 294	161. 835	167, 357	169, 481	169, 899	174, 869	166, 231	177, 048	2, 029, 678
Output:													
Gasoline	78, 807	69, 538	76, 561	74, 831	80, 146	77, 899	81, 009	80, 388	78, 516	81, 927	77, 818	81, 611	939, 051
Kerosine	10, 538	8, 789	8, 974	8, 166	7, 361	6, 715	6, 974	7, 175	8, 093	9, 339	9, 273	10, 755	102, 152
Distillate fuel oil	33, 108	28, 192	29, 013	25, 482	25, 311	23, 294	26, 141	28, 390	29, 999	31, 024	28, 871	32, 000	340, 825
Residual fuel oil	41, 999	35, 904	39, 195	34, 591	35, 553	31, 155	32. 043	33, 183	33, 231	35, 361	35, 411	37, 283	424, 909
Lubricating oil	4, 193	3, 638	3, 698	3, 457	3, 606	3, 804	3, 554	3, 510	3. 729	4, 116	3, 984	4. 100	45, 389
Wax [1]	277	220	274	247	259	261	229	238	260	356	257	330	3, 208
Coke [1]	1, 439	1, 263	1, 378	1, 303	1, 614	1, 409	1, 510	1, 520	1, 337	1, 464	1, 401	1. 321	16. 959
Asphalt [1]	3, 060	2, 507	2, 897	3. 581	4, 394	4. 945	5, 137	5, 603	5, 237	4, 964	3, 766	2, 916	49, 007
Road oil	200	245	292	510	772	1, 149	1, 299	1, 521	943	430	253	77	7, 691
Still gas [1]	6, 524	5, 932	6, 821	6, 962	7, 859	7, 584	7, 555	7, 303	6, 722	6, 758	6, 207	6, 394	82, 621
LR-gases	2, 228	2, 115	1, 879	2, 000	1, 800	1, 800	1, 872	1, 915	1, 928	2, 024	1, 828	2, 080	23, 469
Other miscellaneous	453	406	399	401	361	357	297	314	308	261	370	309	4, 236
Unfinished gasoline (net)	119	164	63	[2] 290	107	[2] 465	[2] 623	[2] 195	199	[2] 261	441	323	[2] 418
Other unfinished oils (net)	[2] 1, 100	1, 008	816	[2] 1, 125	[2] 1, 103	1, 731	57	[2] 1, 519	[2] 640	[2] 2, 556	[2] 3, 484	[2] 2, 091	[2] 10, 006
Shortage	[3] 53	[3] 167	236	506	254	197	303	135	37	[3] 338	[3] 165	[3] 360	585
Total output	181, 792	159, 754	172, 496	160, 622	168, 294	161, 835	167, 357	169, 481	169, 899	174, 869	166. 231	177, 048	2, 029, 678
1950 [4]													
Input:													
Crude petroleum	169, 987	148, 837	165, 418	155, 797	171, 599	169, 663	182, 330	188, 078	181. 778	188, 393	182, 539	190. 448	2, 094, 867
Natural gasoline	7, 279	6, 773	7, 352	6, 984	7, 113	7, 321	7, 506	8, 510	8, 520	9, 302	8, 968	9, 011	94, 639
Total output	177, 266	155, 610	172, 770	162, 781	178, 712	176, 984	189, 836	196, 588	190, 298	197, 695	191, 507	199. 459	2, 189, 506
Output:													
Gasoline	79, 835	71, 458	78, 702	75. 238	82, 071	82, 449	87, 871	90, 877	85, 459	89, 117	85, 776	89, 240	998, 093
Kerosine	11, 140	9, 469	10, 100	8, 848	9, 790	8, 477	9, 091	9, 828	9, 989	10, 264	10, 255	11, 261	118, 512
Distillate fuel oil	32, 489	28, 729	29, 070	29, 301	30, 920	31, 112	32, 253	33, 765	35, 392	37, 723	36, 530	41, 628	398, 912
Residual fuel oil	37, 491	32, 818	35, 768	31, 426	32, 954	32, 058	35, 338	35, 585	35, 343	38, 759	37, 202	40, 475	425, 217
Lubricating oil	3, 932	3, 587	4, 086	3, 645	4, 039	4, 002	4, 151	4, 686	4, 646	4, 987	4, 906	5, 068	51, 735
Wax [1]	314	362	285	365	374	353	344	407	410	383	429	436	4, 462
Coke [1]	1, 454	1, 295	1, 271	1, 230	1, 482	1, 519	1, 591	1, 576	1, 415	1, 447	1. 439	1, 505	17, 224
Asphalt [1]	2, 943	2, 523	3, 315	3, 684	5. 111	5, 741	6, 453	6, 853	6, 587	6, 271	4, 815	3, 944	58, 240
Road oil	146	155	161	442	576	981	1, 086	1, 396	953	589	256	187	6, 928

Still gas [1]	6, 150	5, 659	6, 270	6, 268	7, 278	7, 482	8, 085	7, 970	7, 360	7, 268	6, 885	7, 068	83, 743
LR-gases	2, 334	1, 984	2, 164	2, 356	2, 272	2, 267	2, 397	2, 442	2, 298	2, 611	2, 862	3, 096	29, 083
Other miscellaneous	312	273	391	367	360	385	404	448	349	460	421	547	4, 717
Unfinished gasoline (net)	817	[2] 55	223	[2] 369	[2] 353	[2] 72	238	[2] 642	200	76	90	90	243
Other unfinished oils (net)	[2] 1, 527	[2] 2, 658	983	[2] 128	2, 051	408	667	1, 346	[2] 162	[2] 2, 243	[2] 544	[2] 5, 084	[2] 6, 891
Shortage	[3] 564	11	[3] 19	108	[3] 213	[3] 178	[3] 133	51	59	[3] 17	185	[3] 2	[3] 712
Total output	177, 266	155, 610	172, 770	162, 781	178, 712	176, 984	189, 836	196, 588	190, 298	197, 695	191, 507	199, 459	2, 189, 506

[1] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[2] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[3] Negative quantity (overage).
[4] Preliminary figures.

TABLE 53.—Runs to stills and output of petroleum products at refineries in the United States, 1949–50, by districts

[Thousands of barrels]

	East Coast	Appalachian	Indiana, Illinois, Kentucky, etc.	Oklahoma, Kansas, etc.	Texas inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas-Louisiana inland, etc.	Rocky Mountain	California	Total
1949											
Input:											
Crude petroleum	280, 357	56, 551	333, 954	155, 216	79, 281	468, 104	157, 768	27, 417	64, 660	320, 913	1, 944, 221
Natural gasoline	1, 690	547	9, 401	8, 071	14, 765	19, 247	4, 654	833	1, 350	24, 899	85, 457
Total input	282, 047	57, 098	343, 355	163, 287	94, 046	487, 351	162, 422	28, 250	66, 010	345, 812	2, 029, 678
Output:											
Gasoline	115, 550	27, 426	177, 635	85, 067	53, 471	225, 776	77, 666	11, 085	29, 797	135, 578	939, 051
Kerosine	10, 446	3, 082	19, 836	7, 217	4, 466	31, 026	17, 380	2, 543	1, 924	4, 232	102, 152
Distillate fuel oil	59, 375	6, 362	48, 437	30, 056	8, 711	87, 540	35, 857	4, 098	11, 288	49, 101	340, 825
Residual fuel oil	68, 712	8, 686	53, 421	23, 236	17, 167	86, 243	19, 934	5, 815	14, 018	127, 677	424, 909
Lubricating oil	8, 645	5, 053	4, 291	3, 823	198	15, 128	2, 242	1, 105	235	4, 669	45, 389
Wax [1]	1, 101	394	248	310	4	553	338	----------	75	185	3, 208
Coke [1]	1, 040	318	8, 067	1, 406	607	1, 624	1, 444	----------	526	1, 927	16, 959
Asphalt [1]	12, 778	1, 859	9, 001	4, 931	2, 618	3, 323	2, 264	2, 818	1, 983	7, 432	49, 007
Road oil	122	2	1, 651	660	----------	59	4	9	1, 637	3, 547	7, 691
Still gas [1]	10, 177	3, 364	17, 813	5, 748	3, 759	22, 400	5, 210	1, 037	2, 012	11, 101	82, 621
LR-gases	3, 457	48	2, 476	746	490	5, 729	4, 610	362	72	5, 479	23, 469
Other miscellaneous	336	274	767	526	423	480	59	216	23	1, 132	4, 236
Unfinished gasoline (net)	8	5	347	[2] 183	1, 638	[2] 1, 597	[2] 126	1	[2] 2	[2] 509	[2] 418
Other unfinished oils (net)	[2] 10, 280	[2] 157	2, 078	[2] 1, 618	[2] 1, 725	8, 293	[2] 1, 432	[2] 600	1, 085	[2] 5, 650	[2] 10, 006
Shortage	580	382	[3] 2, 713	1, 362	2, 219	774	[3] 3, 028	[3] 239	1, 337	[3] 89	585
Total output	282, 047	57, 098	343, 355	163, 287	94, 046	487, 351	162, 422	28, 250	66, 010	345, 812	2, 029, 678
1950 [4]											
Input:											
Crude petroleum	331, 368	60, 382	379, 143	177, 285	76, 221	479, 085	171, 407	26, 107	72, 539	321, 330	2, 094, 867
Natural gasoline	4, 715	470	9, 852	8, 131	13, 394	23, 854	4, 868	1, 361	1, 393	26, 601	94, 639
Total input	336, 083	60, 852	388, 995	185, 416	89, 615	502, 939	176, 275	27, 468	73, 932	347, 931	2, 189, 506
Output:											
Gasoline	135, 556	27, 023	197, 848	97, 994	51, 489	222, 837	81, 994	9, 886	33, 599	139, 867	998, 093
Kerosine	13, 304	3, 808	23, 996	6, 400	4, 242	38, 103	20, 073	2, 677	2, 080	3, 829	118, 512
Distillate fuel oil	73, 482	7, 785	62, 485	37, 920	10, 690	101, 938	37, 709	5, 325	13, 852	47, 726	398, 912
Residual fuel oil	76, 094	9, 456	57, 674	21, 824	14, 810	86, 589	21, 053	4, 064	15, 063	118, 590	425, 217
Lubricating oil	10, 214	5, 395	4, 800	4, 174	74	16, 590	4, 520	1, 600	250	4, 118	51, 735
Wax [1]	1, 478	352	283	406	6	793	742	----------	98	304	4, 462
Coke [1]	1, 762	286	7, 891	1, 406	322	1, 417	1, 538	165	638	1, 799	17, 224

Asphalt [1]	15,126	2,069	10,639	5,753	3,312	2,999	3,509	3,428	2,274	9,131	58,240
Road oil	131	------	1,397	834	------	71	2	11	1,838	2,644	6,928
Still gas [1]	11,230	3,536	18,792	6,182	2,974	20,524	5,414	741	2,490	11,860	83,743
LR-gases	4,814	59	2,514	1,034	1,263	7,433	5,467	476	161	5,862	29,083
Other miscellaneous	401	266	843	609	353	621	10	316	11	1,287	4,717
Unfinished gasoline (net)	[2] 573	131	[2] 61	30	509	138	[2] 289	2	24	332	243
Other unfinished oils (net)	[2] 6,923	[2] 96	2,073	[2] 1,055	[2] 2,107	2,810	[2] 2,389	[2] 1,020	709	1,107	[2] 6,891
Shortage	[3] 13	782	[3] 2,179	1,905	1,678	76	[3] 3,078	[3] 203	845	[3] 525	[3] 712
Total output	336,083	60,852	388,995	185,416	89,615	502,939	176,275	27,468	73,932	347,931	2,189,506

[1] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton; 3,600 cubic feet of still gas to the barrel.
[2] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[3] Negative quantity (overage).
[4] Preliminary figures.

REFINERY CAPACITY

The total reported crude capacity of refineries in the United States increased from 6,696,300 barrels daily on January 1, 1950, to 6,963,644 barrels daily at the end of the year—a gain of 267,344 barrels daily. The total capacity in operation increased from 6,222,998 barrels daily on January 1, 1950, to 6,701,815 at the end of the year, while the total capacity of all shut-down units declined from 473,302 barrels daily on January 1, 1950, to 261,829. The total capacity under construction increased from 145,600 barrels daily on January 1, 1950, to 160,100 daily on January 1, 1951.

The total crude capacity of refineries increased, in the 3 years from January 1, 1948, to January 1, 1951, about 929,000 barrels daily or over 15 percent. The principal changes in capacity by refinery districts during this period were gains of 276,000 barrels daily for the Indiana-Illinois district, 191,000 for the Texas Gulf, 173,000 for the East Coast, 113,000 for the Louisiana Gulf, 92,000 for the Oklahoma-Kansas, 76,000 for the Mountain, and 72,000 for the California. Declines included 35,000 barrels daily for the Texas Inland district, 26,000 for the Arkansas-Inland Louisiana, and 3,000 barrels daily for the Appalachian.

Assuming that refineries could run annually at 95 percent of reported capacity, potential crude runs on January 1, 1950, were 6,361,000 barrels and on January 1, 1951, 6,615,000 barrels daily compared with actual crude runs averaging 5,739,000 barrels daily in 1950.

TABLE 54.—Petroleum-refinery capacity in the United States, Jan. 1, 1946–51

Year	Number of refineries				Capacity (barrels per day)			
	Operating	Shut down	Total	Building	Operating	Shut down	Total	Building
1946	364	29	393	1	5,086,165	229,691	5,315,856	53,100
1947	361	38	399		5,336,399	233,083	5,569,482	162,200
1948	352	38	390	2	5,825,566	208,686	6,034,252	367,250
1949	336	39	375	3	6,230,505	208,490	6,438,995	341,500
1950	320	47	367	2	6,222,998	473,302	6,696,300	145,600
1951	325	32	357	1	6,701,815	261,829	6,963,644	160,100

AVIATION GASOLINE

The total demand for aviation gasoline rose from 15.2 million barrels in 1946 to 43.0 million in 1948, declined to 42.8 million in 1949, and rose to 46.6 million in 1950. Exports of aviation gasoline increased from 2.3 million barrels in 1946 to 6.2 million in 1948, rose to 8.8 million in 1949, and declined to 7.0 million in 1950. The domestic demand for aviation gasoline in continental United States amounted to 12.9 million barrels in 1946, rose to 36.7 million in 1948, declined to 34.0 million in 1949, and increased to 39.6 million in 1950. This domestic demand included reported deliveries to all military agencies of 17.6 million barrels in 1948, 16.8 million in 1949, and 19.9 million in 1950.

The total demand for aviation grades of 100 octane and above amounted to 33.2 million barrels in 1948, 33.8 million in 1949, and 37.6 million in 1950. The total demand for lower grades and components was 9.8 million barrels in 1948, 9.0 million in 1949, and 9.0 million in 1950. Changes in the indicated total demand by districts in 1950, compared with 1949, were increases of 1.2 million barrels for district 1 and 0.5 million for district 2, a decline of 1.2 million for district 3, and increases of 0.2 million for district 4 and 3.1 million for district 5.

Jet fuels are not included under aviation gasoline as they are primarily blends of low-grade gasoline with either light distillate fuel oil or kerosine.

Aviation gasoline is discussed separately because of the special interest in this type of fuel, but all aviation-gasoline figures are also included in the total figures for motor fuel and gasoline in this chapter. The figures for aviation gasoline represent the amounts so identified and reported by producing companies but do not include the aviation consumption of regular automotive types of gasoline that are used by many small planes. It should be noted that, in the production figures for aviation gasoline, the item "transfers out" represents rejected material returned for use as automotive gasoline; this item is subtracted from the gross production figure of aviation gasoline to determine the net production of marketable grades.

TABLE 55.—Salient statistics of aviation gasoline in the United States, 1948 (total), and in 1949, by months

[Thousands of barrels]

	1949													1948
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Production:														
100-octane and above	3,297	2,746	3,078	3,106	3,125	3,039	2,735	2,954	2,805	2,844	2,529	2,957	35,215	33,421
Other grades	860	930	727	869	826	1,093	879	1,082	913	1,111	1,319	1,129	11,738	12,825
Transfers out [1]	38	86	57	168	171	290	262	242	277	385	258	434	2,668	3,285
Exports	1,035	777	987	572	1,038	874	682	805	573	396	733	292	8,764	6,237
Stocks:														
100-octane and above	3,170	3,430	3,123	3,500	3,088	3,144	3,156	2,782	2,817	3,117	2,902	3,338	3,338	[3] 2,504
Other grades	3,620	3,971	3,933	3,857	3,764	3,697	3,428	3,397	3,354	3,489	3,920	4,106	4,106	[3] 3,411
Domestic demand: All grades	2,209	2,202	3,106	2,934	3,247	2,979	2,927	3,394	2,876	2,739	2,641	2,738	33,992	36,720
Total demand,[2] by grades:														
100-octane and above	2,633	2,450	3,391	2,726	3,516	2,966	2,722	3,284	2,650	2,418	2,620	2,445	33,821	33,206
Other finished	574	509	694	760	749	865	827	873	769	694	726	560	8,600	9,148
Components	37	20	8	20	20	22	60	42	30	23	28	25	335	603
Production, by districts:														
100-octane and above:														
District 1	294	186	139	150	175	184	203	120	153	182	76	98	1,960	2,247
District 2	136	128	224	270	270	211	206	283	319	381	320	322	3,070	1,672
District 3	1,916	1,868	1,896	1,502	2,005	1,898	1,600	1,660	1,640	1,582	1,648	1,912	21,127	19,024
District 4	23	23	25	25	17	36	16	21	23	3	3	6	221	342
District 5	928	541	794	1,159	658	710	710	870	670	696	482	619	8,837	10,136
Total	3,297	2,746	3,078	3,106	3,125	3,039	2,735	2,954	2,805	2,844	2,529	2,957	35,215	33,421
Other grades:														
District 1	9	43	34	4	23	11	−4	72	34	20	78	39	363	613
District 2	145	184	107	95	146	197	85	146	93	84	42	171	1,495	1,421
District 3	484	359	402	775	317	502	488	721	615	718	642	649	6,672	8,296
District 4	12	11	11	5	20	14	24	8	15	24	16	25	185	184
District 5	210	333	173	−10	320	369	286	135	156	265	541	245	3,023	2,311
Total	860	930	727	869	826	1,093	879	1,082	913	1,111	1,319	1,129	11,738	12,825

Stocks, by districts, end of period:														
100-octane and above:														
District 1	329	377	336	251	289	216	253	227	194	250	241	301	301	258
District 2	342	325	316	349	356	392	385	331	339	384	424	493	493	311
District 3	1,653	1,889	1,624	1,806	1,423	1,659	1,683	1,314	1,433	1,555	1,365	1,490	1,490	1,438
District 4	8	10	9	11	11	8	9	5	7	7	8	9	9	8
District 5	838	829	838	1,083	1,009	869	826	905	844	921	864	1,045	1,045	[3] 489
Total	3,170	3,430	3,123	3,500	3,088	3,144	3,156	2,782	2,817	3,117	2,902	3,338	3,338	[3] 2,504
Other grades:														
District 1	401	426	431	385	360	331	307	299	302	293	366	398	398	422
District 2	611	775	794	748	736	734	622	592	544	512	434	526	526	509
District 3	1,850	1,701	1,624	1,847	1,620	1,439	1,328	1,454	1,508	1,588	1,696	1,806	1,806	1,801
District 4	45	46	48	40	40	34	42	31	33	40	44	59	59	41
District 5	713	1,023	1,036	837	1,008	1,159	1,129	1,021	967	1,056	1,380	1,317	1,317	[3] 638
Total	3,620	3,971	3,933	3,857	3,764	3,697	3,428	3,397	3,354	3,489	3,920	4,106	4,106	[3] 3,411
Total demand,[2] by districts:														
District 1	244	147	188	257	155	277	165	192	204	124	83	19	2,055	2,358
District 2	148	164	321	330	373	307	353	493	444	445	397	325	4,100	2,694
District 3	2,122	2,079	2,635	1,847	2,866	2,250	2,133	2,521	1,922	1,837	2,215	2,148	26,575	25,322
District 4	31	31	35	35	31	57	31	44	33	15	11	15	369	504
District 5	699	558	914	1,037	860	962	927	949	846	714	668	523	9,657	12,079
Total	3,244	2,979	4,093	3,506	4,285	3,853	3,609	4,199	3,449	3,135	3,374	3,030	42,756	42,957

[1] Reject material used as automotive gasoline.
[2] Includes exports.
New basis, to compare with 1949.

TABLE 56.—Salient statistics of aviation gasoline in the United States, 1949 (total) and 1950, by months

[Thousands of barrels]

	1950 [1]													1949
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Production:														
100-octane and above	1,806	1,834	2,335	2,728	2,944	2,859	3,320	4,152	3,929	4,247	4,198	4,883	39,235	35,215
Other grades	1,238	836	1,013	409	837	1,095	944	744	1,178	1,357	1,270	1,026	11,947	11,738
Transfers out [2]	250	288	496	366	406	513	441	448	326	352	577	370	4,833	2,668
Exports	472	465	271	385	963	487	592	517	597	550	710	975	6,984	8,766
Stocks:														
100-octane and above	3,341	3,316	3,075	3,252	3,288	3,023	3,226	3,260	2,970	3,256	3,802	3,744	3,744	3,338
Other grades	4,599	4,710	4,683	4,194	3,850	3,570	3,430	2,873	3,030	3,323	3,413	3,476	3,476	4,106
Domestic demand: All grades	1,826	1,831	2,849	2,698	2,720	3,499	3,168	4,454	4,317	4,123	3,545	4,559	39,589	33,990
Total demand,[3] by grades:														
100-octane and above	1,770	1,794	2,497	2,446	2,791	3,029	3,008	3,979	4,064	3,819	3,546	4,824	37,567	33,821
Other finished	514	473	597	606	835	857	728	951	805	832	680	645	8,523	8,600
Components	14	29	26	31	57	100	24	41	45	22	29	65	483	335
Production, by districts:														
100-octane and above:														
District 1	150	118	156	126	150	128	194	324	317	443	359	475	2,940	1,960
District 2	128	192	243	281	486	414	270	373	266	330	304	257	3,544	3,070
District 3	1,247	1,094	1,290	1,516	1,512	1,448	1,722	1,992	2,143	2,075	2,304	2,630	20,973	21,127
District 4	11	16	21	10	20	14	31	30	37	32	87	65	374	221
District 5	270	414	625	795	776	855	1,103	1,433	1,166	1,367	1,144	1,456	11,404	8,837
Total	1,806	1,834	2,335	2,728	2,944	2,859	3,320	4,152	3,929	4,247	4,198	4,883	39,235	35,215
Other grades:														
District 1	62	26	8	66	−2	99	161	80	101	−31	----------	−11	559	363
District 2	195	121	142	80	40	157	181	127	94	157	140	219	1,653	1,495
District 3	589	422	703	202	715	621	560	501	707	1,037	716	713	7,486	6,672
District 4	10	9	18	13	19	32	15	19	28	25	−12	8	184	185
District 5	382	258	142	48	65	186	27	17	248	169	426	97	2,065	3,023
Total	1,238	836	1,013	409	837	1,095	944	744	1,178	1,357	1,270	1,026	11,947	11,738

Stocks, by districts, end of period:														
100-octane and above:														
District 1	346	339	313	249	272	178	274	270	271	252	324	220	220	301
District 2	424	384	359	375	443	469	463	464	394	493	602	653	653	493
District 3	1,631	1,605	1,591	1,767	1,624	1,431	1,525	1,613	1,593	1,541	1,749	1,963	1,963	1,490
District 4	12	14	20	15	19	16	13	17	22	11	19	16	16	9
District 5	928	974	792	846	930	929	951	896	690	959	1,108	892	892	1,045
Total	3,341	3,316	3,075	3,252	3,288	3,023	3,226	3,260	2,970	3,256	3,802	3,744	3,744	3,338
Other grades:														
District 1	427	409	331	371	288	303	365	379	466	403	392	373	373	398
District 2	640	636	646	603	492	465	541	511	472	526	572	702	702	526
District 3	1,969	2,026	2,222	1,937	1,859	1,569	1,495	1,227	1,307	1,600	1,684	1,696	1,696	1,806
District 4	60	60	65	66	71	84	77	81	92	103	78	74	74	59
District 5	1,503	1,579	1,419	1,217	1,140	1,149	952	675	693	691	687	631	631	1,317
Total	4,599	4,710	4,683	4,194	3,850	3,570	3,430	2,873	3,030	3,323	3,413	3,476	3,476	4,106
Total demand,[3] by districts:														
District 1	123	140	215	192	175	234	123	366	317	478	277	580	3,220	2,055
District 2	275	312	364	366	551	527	360	518	465	334	285	287	4,644	4,100
District 3	1,394	1,370	1,599	1,655	2,116	2,184	2,005	2,456	2,586	2,629	2,527	2,868	25,389	26,575
District 4	17	23	28	27	30	36	56	36	46	54	91	80	524	369
District 5	489	451	914	843	811	1,005	1,216	1,595	1,500	1,178	1,075	1,719	12,796	9,657
Total	2,298	2,296	3,120	3,083	3,683	3,986	3,760	4,971	4,914	4,673	4,255	5,534	46,573	42,756

[1] Preliminary figures. [2] Reject material used as automotive gasoline. [3] Includes exports.

MOTOR FUEL

The total demand for motor fuel set another new record, increasing from 953.1 million barrels in 1949 to 1,019.0 million in 1950, a gain of 6.9 percent. Exports declined sharply from 39.4 million barrels in 1949 to 24.5 million in 1950. Domestic demand in continental United States increased from 913.7 million barrels in 1949 to 994.5 million in 1950, a gain of 8.8 percent. The domestic demand for aviation gasoline, included in the total, rose from 34.0 million barrels in 1949 to 39.6 million in 1950. There were no imports of motor fuel in 1949 and only 0.2 million barrels in 1950.

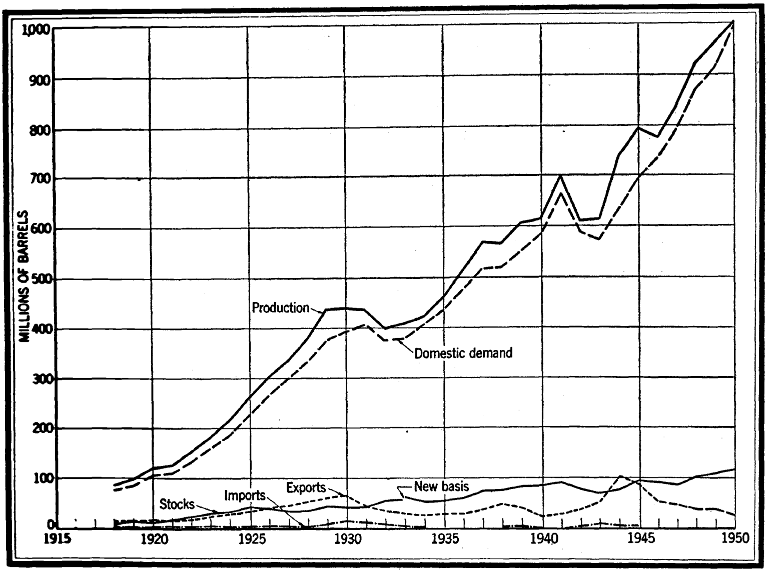

FIGURE 8.—**Production**, domestic demand, exports, imports, and stocks of motor fuel in the United States, 1918–50

TABLE 57.—Salient statistics of motor fuel in the United States, 1948 (total) and 1949, by months

[Thousands of barrels]

	1949						
	Jan.	Feb.	Mar.	Apr.	May	June	July
Production:							
Refinery gasoline:							
Gasoline	70,856	62,031	68,548	67,238	71,666	69,394	72,467
Naphtha	1,454	1,193	1,436	1,194	1,239	1,209	1,273
Natural gasoline, etc	13,053	12,127	12,836	12,397	12,532	12,013	12,491
Less sales of LP-gases and transfers of cycle products [1]	4,553	3,959	3,765	3,644	3,243	3,208	3,278
Motor benzol, etc	11	11	11	11	11	11	11
Total production	80,821	71,403	79,066	77,196	82,205	79,419	82,964
Daily average	2,607	2,550	2,551	2,573	2,652	2,647	2,676
Imports							
Exports	3,995	3,660	4,081	3,832	4,231	3,528	2,399
Daily average	129	131	132	128	136	118	77
Stocks, end of period:							
Finished gasoline	108,544	117,496	118,822	117,020	113,164	106,068	103,867
Natural gasoline, etc	6,217	7,028	7,405	7,253	7,418	7,031	7,668
Total stocks	114,761	124,524	126,227	124,273	120,582	113,099	111,535
Domestic demand	63,125	57,980	73,282	75,318	81,665	83,374	82,129
Daily average	2,036	2,071	2,364	2,511	2,634	2,779	2,649

	1949—Continued						1948 (total)
	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Production:							
Refinery gasoline:							
Gasoline	71,686	69,720	72,258	69,005	72,626	837,495	801,416
Naphtha	1,383	1,326	1,368	1,364	1,660	16,099	18,333
Natural gasoline, etc	13,142	13,354	14,033	14,329	14,779	157,086	146,721
Less sales of LP-gases and transfers of cycle products [1]	3,915	4,029	4,430	4,923	5,505	48,452	44,905
Motor benzol, etc	11	11	30	30	30	189	358
Total production	82,307	80,382	83,259	79,805	83,590	962,417	921,923
Daily average	2,655	2,679	2,686	2,660	2,696	2,637	2,519
Imports							302
Exports	4,020	2,613	2,867	2,262	1,859	39,347	37,302
Daily average	130	87	92	75	60	108	102
Stocks, end of period:							
Finished gasoline	97,724	94,445	96,194	97,173	103,586	103,586	95,481
Natural gasoline, etc	7,391	7,607	6,923	7,141	6,831	6,831	5,579
Total stocks	105,115	102,052	103,117	104,314	110,417	110,417	101,060
Domestic demand	84,707	80,832	79,327	76,346	75,628	913,713	871,270
Daily average	2,732	2,694	2,559	2,545	2,440	2,503	2,381

[1] LP-gases and other natural-gas liquids used for other than motor fuel.

TABLE 58.—Salient statistics of motor fuel in the United States, 1949 (total) and 1950, by months

[Thousands of barrels]

	1950[1]						
	Jan.	Feb.	Mar.	Apr.	May	June	July
Production:							
Refinery gasoline:							
Gasoline	71, 247	63, 408	69, 963	66, 810	73, 074	73, 208	78, 305
Naphtha	1, 309	1, 277	1, 387	1, 444	1, 884	1, 920	2, 060
Natural gasoline, etc	15, 095	13, 587	14, 569	13, 999	14, 229	14, 237	14, 985
Less sales of LP-gases and transfers of cycle products [2]	5, 597	4, 744	5, 150	4, 664	4, 403	4, 201	4, 350
Motor benzol, etc	21	21	17	17	17	17	17
Total production	82, 075	73, 549	80, 786	77, 606	84, 801	85, 181	91, 017
Daily average	2, 648	2, 627	2, 606	2, 587	2, 736	2, 839	2, 936
Imports	-------	-------	1	1	3	2	4
Exports	1, 597	1, 895	1, 691	2, 357	2, 227	1, 914	1, 992
Daily average	52	68	55	79	72	64	64
Stocks, end of period:							
Finished gasoline	116, 624	124, 177	124, 924	119, 584	112, 915	106, 026	102, 769
Natural gasoline, etc	7, 363	8, 098	7, 708	7, 950	8, 163	8, 151	8, 730
Total stocks	123, 987	132, 275	132, 632	127, 534	121, 078	114, 177	121, 499
Domestic demand	66, 908	63, 366	78, 739	80, 348	89, 033	90, 170	91, 707
Daily average	2, 158	2, 263	2, 540	2, 678	2, 872	3, 006	2, 958

	1950[1]—Continued						1949 (total)
	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
Production:							
Refinery gasoline:							
Gasoline	80, 199	74, 853	77, 774	74, 804	78, 058	881, 703	837, 495
Naphtha	2, 168	2, 086	2, 041	2, 004	2, 171	21, 751	16, 099
Natural gasoline, etc	15, 442	15, 459	16, 469	16, 251	17, 236	181, 558	157, 086
Less sales of LP-gases and transfers of cycle products [2]	5, 106	4, 866	5, 374	5, 742	6, 525	60, 722	48, 452
Motor benzol, etc	7	7	7	5	5	158	189
Total production	92, 710	87, 539	90, 917	87, 322	90, 945	1,024,448	962, 417
Daily average	2, 991	2, 918	2, 933	2, 911	2, 934	2, 807	2, 637
Imports	3	2	134	4	2	156	-------
Exports	1, 585	2, 380	2, 340	2, 047	2, 491	24, 516	39, 347
Daily average	51	79	75	68	80	67	108
Stocks, end of period:							
Finished gasoline	99, 423	97, 904	97, 844	100, 995	108, 669	108, 669	103, 586
Natural gasoline, etc	8, 667	8, 581	8, 226	7, 636	7, 355	7, 355	6, 831
Total stocks	108, 090	106, 485	106, 070	108, 631	116, 024	116, 024	110, 417
Domestic demand	94, 537	86, 766	89, 126	82, 718	81, 063	994, 481	913, 713
Daily average	3, 050	2, 892	2, 875	2, 757	2, 615	2, 725	2, 503

[1] Preliminary figures.
[2] LP-gases and other natural-gas liquids used for other than motor fuel.

Production.—The total production of motor fuel rose from 962.4 million barrels in 1949 to 1,024.4 million in 1950. Production in 1950 included an output of 903.4 million barrels of gasoline and naphtha from crude oil at refineries at a yield of 43.0 percent and an output of motor fuel from other light oils amounting to 121.0 million barrels. The latter figure was obtained by adding the total production of light oils from natural gas to the small amount of motor benzol derived from coke ovens and subtracting from this total the amount of these oils that does not eventually end up as motor fuel. The production of these light oils totaled 181.7 million barrels in 1950, and the amounts used as other than motor fuel totaled 60.7 million barrels, leaving a net production of all types of motor fuel of 121.0 million barrels. If the small import of 0.2 million barrels of gasoline is added to the production of 1,024.4 million barrels it amounts to a new supply of 1,024.6 million barrels in 1950, from which the increase of 5.6 million barrels in the combined stocks of finished gasoline and natural gasoline is deducted to arrive at a total demand for motor fuel of 1,019.0 million barrels.

Yields.—The average refinery yield of gasoline and naphtha from crude oil declined from 43.7 percent in 1949 to 43.0 in 1950. The reduction in yield reflected the relatively greater increase in the demand for other products, as well as the gain in the amount of natural gasoline blended at refineries from 9.1 percent of the total refinery output of gasoline in 1949 to 9.5 percent in 1950.

Exports.—Exports of motor fuel from continental United States, including shipments to the Territories, declined sharply from 39.4 million barrels in 1949 to 24.5 million in 1950. Shipments to the Territories rose from 5.6 million barrels in 1949 to 5.9 million in 1950, while exports to foreign countries declined from 33.8 million in 1949 to 18.6 million in 1950, a loss of about 45 percent.

232294—53——61

TABLE 59.—Production of gasoline in the United States in 1950, by districts, and months [1]

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Gasoline:													
East Coast	10,606	9,150	9,903	10,467	11,249	11,141	11,623	11,678	10,876	10,537	9,260	11,263	127,753
Appalachian	2,191	1,853	2,110	2,016	2,257	2,195	2,329	2,296	2,383	2,300	2,053	2,220	26,203
Indiana, Illinois, Kentucky, etc	14,819	12,907	15,281	13,015	15,260	15,714	16,988	16,843	14,376	16,464	16,726	15,880	184,333
Oklahoma, Kansas, etc	7,061	6,452	6,564	6,479	7,464	7,517	8,273	8,232	7,782	7,737	7,384	7,650	88,595
Texas Inland	2,871	2,821	3,087	2,809	3,331	3,136	3,309	3,389	3,189	3,214	3,259	3,325	37,740
Texas Gulf Coast	15,530	14,137	15,511	13,772	14,923	14,522	15,966	17,170	16,805	17,902	17,298	17,626	191,162
Louisiana Gulf Coast	5,761	5,136	5,938	6,398	6,525	6,217	6,468	6,674	6,436	6,404	5,952	6,553	74,462
Arkansas, Louisiana Inland, etc	799	678	658	630	661	613	717	706	737	709	771	720	8,399
Rocky Mountain	2,702	2,412	2,548	2,342	2,489	2,715	2,790	2,922	2,711	2,497	2,836	3,181	32,145
California and Washington	8,907	7,802	8,363	8,882	8,915	9,438	9,842	10,289	9,558	10,010	9,265	9,640	110,911
Total gasoline	71,247	63,408	69,963	66,810	73,074	73,208	78,305	80,199	74,853	77,774	74,804	78,058	881,703
Naphtha:													
East Coast	115	94	96	114	157	359	348	452	320	380	373	280	3,088
Appalachian	15	20	18	31	27	49	33	26	34	39	27	31	350
Indiana, Illinois, Kentucky, etc	210	252	256	295	306	295	355	345	267	378	328	376	3,663
Oklahoma, Kansas, etc	74	85	95	77	163	152	120	108	119	96	91	88	1,268
Texas Inland	25	30	26	11	29	10	43	41	28	28	35	49	355
Texas Gulf Coast	567	457	527	510	709	639	693	749	767	689	712	802	7,821
Louisiana Gulf Coast	180	178	205	189	244	184	227	232	256	235	234	300	2,664
Arkansas, Louisiana Inland, etc	2	----------	17	----------	9	14	18	18	19	11	8	10	126
Rocky Mountain	8	2	11	----------	1	4	2	5	5	8	13	2	61
California and Washington	113	159	136	217	239	214	221	192	271	177	183	233	2,355
Total naphtha	1,309	1,277	1,387	1,444	1,884	1,920	2,060	2,168	2,086	2,041	2,004	2,171	21,751
Percent yield of gasoline and naphtha [2]	42.8	42.7	43.5	43.6	44.0	44.3	44.4	43.8	42.4	41.9	42.0	41.1	43.0
Natural gasoline blended at refineries	7,279	6,773	7,352	6,984	7,113	7,321	7,506	8,510	8,520	9,302	8,968	9,011	94,639
Total production:													
East Coast	10,822	9,616	10,249	10,801	11,702	11,996	12,466	12,724	11,595	11,465	10,126	11,994	135,556
Appalachian	2,259	1,916	2,171	2,089	2,320	2,276	2,399	2,359	2,449	2,377	2,113	2,295	27,023
Indiana, Illinois, Kentucky, etc	15,759	13,891	16,330	14,103	16,393	16,925	18,154	18,082	15,381	17,761	18,001	17,068	197,848
Oklahoma, Kansas, etc	7,865	7,124	7,310	7,231	8,309	8,199	8,831	8,955	8,623	8,740	8,299	8,508	97,994
Texas Inland	4,129	3,844	4,376	3,978	4,434	4,004	4,254	4,350	4,477	4,537	4,539	4,567	51,489
Texas Gulf Coast	17,935	16,218	17,948	15,958	17,106	16,835	18,445	20,267	19,944	20,952	20,316	20,913	222,837
Louisiana Gulf Coast	6,439	5,754	6,489	6,951	7,167	6,742	7,065	7,260	7,115	7,071	6,649	7,292	81,994
Arkansas, Louisiana Inland, etc	889	757	801	758	786	755	880	846	845	820	879	870	9,886
Rocky Mountain	2,834	2,527	2,660	2,431	2,589	2,807	2,872	3,019	2,835	2,662	3,027	3,336	33,599
California and Washington	10,904	9,811	10,368	10,938	11,265	11,910	12,505	13,015	12,195	12,732	11,827	12,397	139,867
Total: 1950	79,835	71,458	78,702	75,238	82,071	82,449	87,871	90,877	85,459	89,117	85,776	89,240	998,093
1949	78,807	69,538	76,561	74,831	80,146	77,899	81,009	80,388	78,516	81,927	77,818	81,611	939,051

[1] Preliminary figures.
[2] Based on crude runs to stills adjusted for net change in stocks of unfinished oils.

Domestic Demand.—The domestic demand for motor fuel set another new record, increasing from 913.7 million barrels in 1949 to 994.5 million in 1950. Average demand rose from 2,503,000 barrels daily in 1949 to 2,725,000 daily in 1950. Domestic demand in the first quarter of 1950 averaged 2,322,000 barrels daily, a gain of 7.5 percent compared with the first quarter of 1949; demand in the second quarter averaged 2,852,000 barrels daily, a gain of 8.0 percent; demand in the third quarter averaged 2,968,000 barrels daily, a gain of 10.3 percent; and demand in the fourth quarter was 2,749,000 barrels daily, or 9.3 percent above that in the last quarter of 1949.

The annual survey of the Bureau of Public Roads includes an analysis of civilian motor-fuel consumption based on tax returns of the various States. The total given in this survey is considerably smaller than the domestic demand shown by the Bureau of Mines. The difference represents deliveries to the armed forces, any losses in production and transportation before the point of tax incidence and any commercial or industrial uses of gasoline or naphtha not recorded in the exemptions from State taxes. On the other hand, the survey includes, in addition to gasoline, Diesel and other fuels for highway use.

In 1949 the total use of motor fuel shown by the Bureau of Public Roads was 877.0 million barrels, including 772.2 million for highway use, 95.4 million for nonhighway use, and 9.4 million allowed for losses. Highway use included 8.6 million barrels of fuels other than gasoline, primarily Diesel oil and liquefied gases. This figure was incomplete, as two States did not tax these fuels, and six other States taxed them but did not separate the data from gasoline use. In 1950, the total use of motor fuel amounted to 959.0 million barrels, including 848.9 million for highway use, 99.4 million for nonhighway use, and 10.7 million allowed for losses.

Production and Consumption, by States.—Table 60, showing the production and consumption of gasoline by States, is designed to indicate roughly the areas of surplus production and deficit supply. The refinery-production figures are compiled from reports to the Bureau of Mines and do not include the natural gasoline which does not pass through refineries. The consumption figures used are compiled from State tax reports by the American Petroleum Institute. They include deliveries to the armed forces for use in continental United States but exclude shipments to the armed forces abroad. Some losses and at least part of the naphthas not subject to taxation are excluded.

In 1950, refinery production amounted to 998.1 million barrels and consumption, as defined above, to 967.0 million barrels. The production figure includes a large part of the gasoline for export and also part of the additions to storage in 1950. The consumption figure of 967.0 million barrels in 1950 was 27.5 million less than the domestic demand figure of 994.5 million barrels shown by the Bureau of Mines.

Comparison of production and consumption by broad districts indicates the major problems of distribution between surplus and deficit areas. The Gulf Coast district (including Texas, Louisiana, Mississippi, and Alabama) showed a refinery production of 358.5 million barrels of gasoline in 1950 compared with a consumption of 107.5 million—a surplus of 251.0 million. Known movements out

TABLE 60.—Production and consumption of gasoline in the United States, 1948–50, by States

[Thousands of barrels]

State	1948		1949		1950 [1]	
	Production	Consumption [2]	Production	Consumption [2]	Production	Consumption [2]
Alabama	(3)	11,342	(3)	12,239	(3)	13,653
Arizona		4,936		5,059		5,569
Arkansas	6,026	7,806	6,642	8,445	7,756	9,147
California	[4] 126,214	86,744	[4] 135,578	89,506	[4] 139,867	91,776
Colorado	2,618	9,416	3,423	10,029	3,844	10,828
Connecticut		10,528		11,174		12,154
Delaware		1,988		2,177		2,395
District of Columbia		3,992		4,355		4,715
Florida		17,350		18,620		20,922
Georgia	[5] 7,984	15,195	[5] 6,294	16,403	[5] 7,820	18,442
Idaho	(6)	4,164	(6)	4,372	(6)	4,756
Illinois	[7] 65,500	46,926	[7] 67,539	49,743	[7] 71,215	54,276
Indiana	53,387	25,059	58,314	26,421	63,320	29,222
Iowa		20,239		21,312		22,734
Kansas	[8] 40,970	16,186	[8] 39,373	16,746	[8] 46,088	17,566
Kentucky	[9] 10,694	11,692	[9] 12,909	12,506	[9] 13,210	13,640
Louisiana	[3] 71,670	10,475	[3] 82,109	11,722	[3] 84,125	13,195
Maine		4,998		5,150		5,400
Maryland	(5)	10,572	(5)	11,491	(5)	12,830
Massachusetts	[10] 3,803	20,619	[10] 2,926	21,937	[10] 1,455	23,634
Michigan	11,879	41,034	12,042	42,171	11,787	46,611
Minnesota	(7)	19,604	(7)	20,658	(7)	22,046
Mississippi	(3)	8,594	(3)	9,480	(3)	10,333
Missouri	(8)	23,435	(8)	25,294	(8)	27,732
Montana	4,545	4,860	5,447	5,095	6,756	5,389
Nebraska	(8)	9,562	(8)	10,031	(8)	10,986
Nevada		1,558		1,596		1,818
New Hampshire		2,862		2,970		3,187
New Jersey	34,651	26,393	35,096	27,922	51,172	31,378
New Mexico	2,303	4,663	2,397	4,882	2,717	5,453
New York	8,858	54,359	9,637	58,710	9,171	63,046
North Carolina		18,162		19,821		22,268
North Dakota		5,965		6,240		6,249
Ohio	35,847	46,486	38,862	49,165	50,117	53,691
Oklahoma	43,861	14,637	45,694	15,437	51,906	16,813
Oregon		11,258		11,434		12,313
Pennsylvania	69,446	46,937	74,587	49,287	79,181	53,056
Rhode Island	(10)	3,634	(10)	3,748	(10)	4,072
South Carolina	(5)	9,188	(5)	10,049	(5)	11,024
South Dakota		6,074		6,351		6,634
Tennessee	(9)	13,693	(9)	15,200	(9)	16,752
Texas	275,812	63,447	279,247	65,531	274,326	70,322
Utah	5,170	4,240	6,711	4,445	7,658	4,948
Vermont		2,151		2,229		2,320
Virginia		16,105		17,820		19,830
Washington	(4)	14,738	(4)	15,019	(4)	16,221
West Virginia	2,616	8,070	2,405	8,409	1,978	8,945
Wisconsin	(7)	20,894	(7)	21,850	(7)	23,571
Wyoming	[6] 12,132	2,876	[6] 11,819	2,970	[6] 12,624	3,124
Total	895,986	845,706	939,051	893,221	998,093	966,986

[1] Preliminary figures.
[2] American Petroleum Institute.
[3] Alabama and Mississippi included with Louisiana.
[4] Washington included with California.
[5] Maryland and South Carolina included with Georgia.
[6] Idaho included with Wyoming.
[7] Minnesota and Wisconsin included with Illinois.
[8] Missouri and Nebraska included with Kansas.
[9] Tennessee included with Kentucky.
[10] Rhode Island included with Massachusetts.

of this district in 1950 include shipments to the Atlantic States of 166.7 million barrels by boat and pipeline deliveries of 14.1 million barrels to the Atlantic States, 22.2 million to the Central States, and 1.7 million to the Mountain States. In addition, there were some barge and tank-car shipments to other States, and a considerable part of United States exports originated in this area.

The Atlantic Coast States produced 148.8 million barrels of gasoline in 1950 and consumed 309.3 million—a deficit of 160.5 million. The principal receipts from other districts in 1950 included 166.7 million by boat from the Gulf Coast district, 5.9 million from California, 3.2 million by barge from the Central and Gulf States, and 14.1 million by pipeline from the Gulf States. The movements out of the Atlantic Coast States included 4.8 million barrels by pipeline to the Central States and a considerable volume of export and overseas military deliveries.

The Pacific Coast district (California, Oregon, Washington, Nevada, and Arizona) produced 139.9 million barrels of gasoline in 1950 and consumed 129.1 million. With a decrease of 2.3 million barrels of finished gasoline stocks, there was a surplus of 13.1 million barrels for export or delivery to other States. Of this amount, 5.9 million barrels represented deliveries by boat to the Atlantic Coast States.

The Rocky Mountain States (Idaho, Montana, Wyoming, Colorado, Utah, and New Mexico) produced 33.6 million barrels in 1950 and consumed 34.5 million—a deficit of 0.9 million barrels, which was the balance of receipts from and shipments to the Pacific Coast district and States to the east. Pipeline receipts from the Gulf States amounted to 1.7 million barrels in 1950.

The remaining Central States produced 317.4 million barrels of gasoline in 1950 and consumed 386.6 million—a deficit of 69.2 million barrels supplied by receipts by pipeline, tank car, and barge from adjacent districts. The principal known movements in 1950 were receipts by pipeline of 22.2 million barrels from the Gulf States and 4.8 million barrels from the Atlantic States.

While by no means complete, the foregoing review gives a fair idea of the general domestic distribution of motor fuels and the trends of consumption in different areas.

Methods of Distribution.—The total deliveries of gasoline by pipeline rose from 278.0 million barrels in 1949 to 306.4 million in 1950. The major part of this movement was within the main districts. Inter-district movements recorded in 1950 comprised a movement of 14.1 million barrels from district 3 to district 1, of 22.2 million to district 2, and 1.7 million barrels to district 4. The pipeline movement from district 1 to district 2 amounted to 4.8 million barrels.

The boat movement of gasoline from the Gulf Coast to the East Coast district rose from 155.6 million barrels in 1949 to 166.7 million in 1950. Receipts by boat on the east coast from California increased from 0.7 million barrels in 1949 to 5.9 million in 1950.

TABLE 61.—Movement of petroleum products by pipelines between PAW districts in the United States in 1949–50, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
From district 1 to district 2:													
Gasoline	367	319	393	426	393	382	478	553	566	582	481	554	5,494
Kerosine	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	19	----------	19
Distillate fuel oil	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
From district 3 to district 1:													
Gasoline	1,207	1,111	1,375	1,313	1,404	1,413	1,491	1,504	1,257	1,177	1,277	1,119	15,648
Kerosine	378	308	263	169	268	102	134	147	286	324	315	419	3,113
Distillate fuel oil	289	215	260	233	154	205	157	264	220	254	258	287	2,796
From district 3 to district 2:													
Gasoline	1,754	1,183	1,744	1,903	2,064	2,266	1,766	1,650	1,693	1,905	1,784	1,866	21,578
Kerosine	73	72	93	131	54	28	22	31	45	95	81	120	845
Distillate fuel oil	407	439	345	203	270	130	353	382	426	313	323	458	4,049
From district 3 to district 4:													
Gasoline	90	96	115	124	129	139	152	153	157	136	148	120	1,559
Kerosine	14	21	4	9	5	4	3	3	11	17	10	24	125
Distillate fuel oil	5	1	4	5	4	4	6	3	5	5	3	7	52
1950													
From district 1 to district 2:													
Gasoline	444	319	345	308	397	449	388	453	422	446	483	325	4,779
Kerosine	37	31	----------	----------	----------	15	25	2	27	----------	12	----------	149
Distillate fuel oil	58	13	----------	----------	11	25	35	----------	33	47	----------	----------	222
From district 3 to district 1:													
Gasoline	1,094	984	1,143	1,214	1,379	1,306	1,317	1,314	1,194	1,191	1,039	961	14,136
Kerosine	430	335	485	220	153	145	215	167	279	280	349	486	3,544
Distillate fuel oil	321	277	290	251	217	254	239	339	301	245	249	319	3,302
From district 3 to district 2:													
Gasoline	1,901	1,728	2,057	1,726	1,965	1,689	1,702	1,743	1,948	2,157	1,909	1,637	22,162
Kerosine	83	133	57	63	53	28	52	120	97	160	183	245	1,274
Distillate fuel oil	433	396	310	227	205	165	217	284	388	363	370	765	4,123
From district 3 to district 4:													
Gasoline	118	113	147	142	148	138	195	200	158	142	118	123	1,742
Kerosine	12	14	11	13	7	3	----------	5	11	8	15	11	110
Distillate fuel oil	4	5	4	7	7	4	5	9	8	8	6	7	74

TABLE 62.—Transportation of petroleum products by pipelines in 1949–50, by months

[Thousands of barrels]

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Turned into lines: [1]													
Motor fuel	20,641	18,184	21,289	23,444	25,218	24,857	25,261	25,765	23,616	24,332	24,282	22,455	279,344
Kerosine	2,241	1,710	1,743	1,279	1,304	749	1,007	815	1,389	1,495	1,754	2,382	17,868
Distillate fuel oil	5,524	5,168	4,205	3,079	2,690	2,762	3,254	3,034	3,938	4,170	4,499	6,858	49,181
Delivered from lines: [1]													
Motor fuel	18,944	17,383	21,486	22,762	25,477	25,069	25,287	26,121	24,278	24,726	23,832	22,633	277,998
Kerosine	2,042	2,009	1,645	1,264	1,141	810	994	803	1,248	1,596	1,714	2,400	17,666
Distillate fuel oil	5,656	5,321	4,827	3,436	2,634	2,526	2,724	2,934	3,603	3,998	4,821	6,617	49,097
Shortage (or overage): [2]													
Motor fuel	59	27	48	84	69	76	82	30	93	75	102	16	761
Kerosine	27	35	26	21	29	17	20	26	16	26	34	28	305
Distillate fuel oil	(1)	(2)	5	(4)	3	(7)	5	(1)	11	3	3	2	17
Stocks in lines and working tanks at end of month:													
Motor fuel	12,984	13,758	13,513	14,111	13,783	13,495	13,387	13,001	12,246	11,777	12,125	11,931	11,931
Kerosine	1,015	681	753	747	881	803	796	782	907	780	786	740	740
Distillate fuel oil	2,774	2,623	1,996	1,643	1,696	1,939	2,464	2,565	2,889	3,058	2,733	2,972	2,972
1950													
Turned into lines: [1]													
Motor fuel	21,798	19,510	24,142	25,128	28,507	27,402	28,284	28,321	25,984	27,220	26,968	25,533	308,797
Kerosine	2,315	2,055	2,210	1,753	1,367	1,060	1,012	1,279	1,299	1,733	2,058	2,726	20,867
Distillate fuel oil	6,702	5,986	5,883	3,910	3,200	3,832	3,973	5,845	6,158	7,068	6,865	10,190	69,612
Delivered from lines: [1]													
Motor fuel	21,215	18,525	23,952	24,761	28,282	27,761	28,164	28,977	25,847	27,752	26,066	25,113	306,415
Kerosine	2,290	1,978	2,350	1,691	1,127	902	1,041	1,233	1,310	1,692	2,039	2,662	20,315
Distillate fuel oil	6,866	6,055	6,664	4,571	3,049	3,001	3,342	4,631	4,986	5,776	7,484	9,865	66,380
Shortage (or overage): [2]													
Motor fuel	37	50	53	73	85	77	106	121	138	81	48	58	927
Kerosine	42	33	42	31	30	21	16	37	22	30	36	36	376
Distillate fuel oil	11	3	(11)	10	4	7	(4)	1	7	22	29	40	119
Stocks in lines and working tanks at end of month:													
Motor fuel	12,477	13,412	13,549	13,843	13,983	13,547	13,561	12,784	12,783	12,170	13,024	13,386	13,386
Kerosine	723	767	585	616	826	963	918	927	894	905	888	916	916
Distillate fuel oil	2,797	2,725	1,955	1,284	1,431	2,165	2,800	4,013	5,178	6,448	5,800	6,085	6,085

[1] The quantities "Turned into lines" and "Delivered from lines" are on a net basis, eliminating intersystem transfers, and are not comparable with data published for previous years.

[2] Figures in parentheses represent overage.

Stocks.—Stocks of gasoline, as reported, include stocks held at refineries and bulk terminals and by pipelines but not stocks in secondary distribution tanks, in consumers' hands, or in military custody.

Stocks of finished gasoline increased 5.1 million barrels in 1950 from 103.6 million on January 1, 1950, to 108.7 million on December 31. Stocks of natural gasoline and other natural-gas liquids increased from 6.8 million barrels at the beginning of the year to over 7.3 million at the end of 1950—a gain of 0.5 million barrels. Stocks of unfinished gasoline increased from 7.9 million barrels to 8.1 million during the year

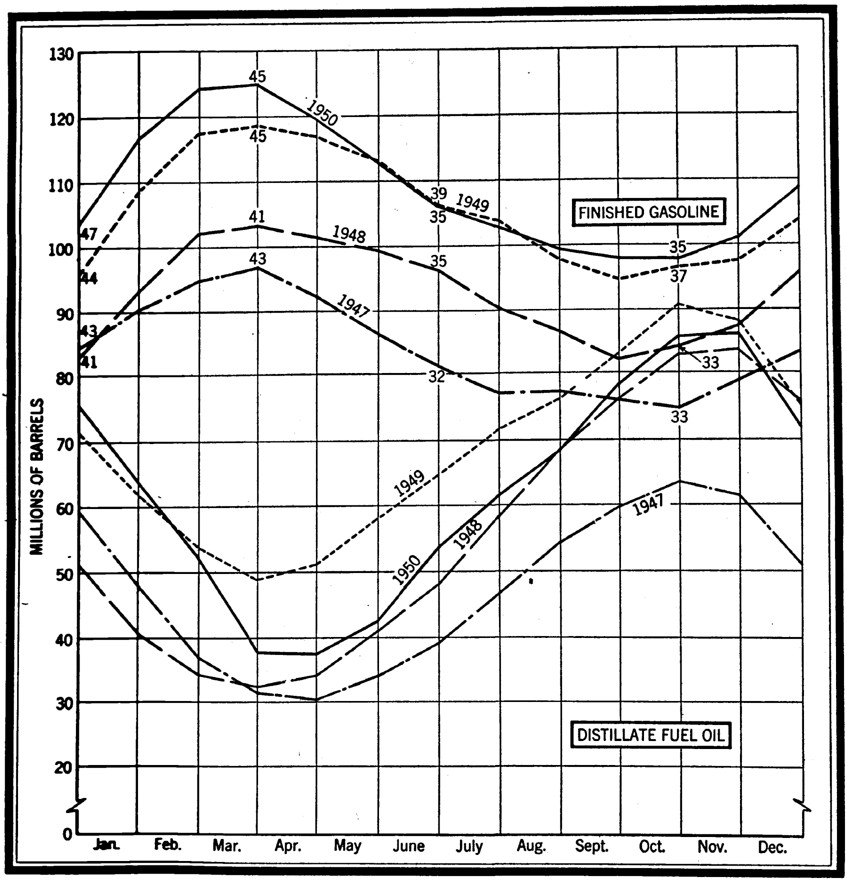

FIGURE 9.—Stocks of finished gasoline in the United States, 1947–50, by months, with figures representing day's supply at certain periods, also stocks of distillate fuel oil 1947–50, by months.

TABLE 63.—Stocks of gasoline in the United States in 1950, by districts and months

[Thousands of barrels]

District	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Finished gasoline:[1]												
East Coast	24,733	25,860	24,547	24,962	24,833	24,832	25,013	24,820	24,155	24,505	23,464	23,599
Appalachian	3,649	3,613	3,532	3,235	3,275	2,979	3,037	2,959	3,280	3,128	3,398	3,483
Indiana, Illinois, Kentucky, etc	25,168	26,707	27,537	26,000	23,139	22,099	22,373	22,161	21,187	21,408	22,310	23,723
Oklahoma, Kansas, etc	12,510	13,953	14,419	13,769	13,705	11,622	10,600	9,450	9,596	9,737	10,637	11,806
Texas Inland	3,452	3,533	3,424	3,397	3,153	2,951	2,939	2,817	3,005	2,872	3,154	3,452
Texas Gulf Coast	14,788	15,900	17,260	15,949	14,866	13,365	13,250	13,118	13,450	12,618	13,319	14,780
Louisiana Gulf Coast	6,426	6,739	7,164	6,136	5,391	5,336	5,358	6,001	5,714	6,143	6,158	7,352
Arkansas, Louisiana Inland, etc	2,940	3,326	2,825	2,604	2,420	2,300	2,361	2,250	2,180	2,207	2,274	2,701
Rocky Mountain	4,194	4,938	5,350	5,359	5,049	4,625	3,863	3,291	2,970	2,539	2,883	3,692
California	18,764	19,608	18,866	18,173	17,084	15,917	13,975	12,556	12,367	12,687	13,398	14,081
Total finished gasoline	116,624	124,177	124,924	119,584	112,915	106,026	102,769	99,423	97,904	97,844	100,995	108,669
Unfinished gasoline:												
East Coast	962	1,012	1,079	1,001	1,020	1,041	1,003	956	1,000	991	1,129	955
Appalachian	386	373	376	347	380	373	355	377	411	399	529	475
Indiana, Illinois, Kentucky, etc	905	870	838	890	793	849	932	826	806	742	782	837
Oklahoma, Kansas, etc	209	197	171	181	232	224	221	203	178	166	172	281
Texas Inland	516	526	411	462	402	347	332	358	344	428	328	330
Texas Gulf Coast	3,721	3,794	4,140	3,851	3,470	3,486	3,477	2,962	3,125	3,336	2,984	3,090
Louisiana Gulf Coast	467	363	404	375	467	426	459	460	378	450	407	412
Arkansas, Louisiana Inland, etc	----------	1	1	1	1	5	1	----------	----------	3	1	3
Rocky Mountain	156	137	140	136	153	145	155	162	173	172	205	173
California	1,352	1,346	1,282	1,229	1,202	1,152	1,351	1,340	1,429	1,233	1,473	1,544
Total unfinished gasoline	8,674	8,619	8,842	8,473	8,120	8,048	8,286	7,644	7,844	7,920	8,010	8,100
Total finished and unfinished gasoline:												
East Coast	25,695	26,872	25,626	25,963	25,853	25,873	26,016	25,776	25,155	25,496	24,593	24,554
Appalachian	4,035	3,986	3,908	3,582	3,655	3,352	3,392	3,336	3,691	3,527	3,927	3,958
Indiana, Illinois, Kentucky, etc	26,073	27,577	28,375	26,890	23,932	22,948	23,305	22,987	21,993	22,150	23,092	24,560
Oklahoma, Kansas, etc	12,719	14,150	14,590	13,950	13.937	11,846	10,821	9,653	9,774	9,903	10,809	12,087
Texas Inland	3,968	4,059	3,835	3,859	3,555	3,298	3,271	3,175	3,349	3,300	3,482	3,782
Texas Gulf Coast	18,509	19,694	21,400	19,800	18,336	16,851	16,727	16,080	16,575	15,954	16,303	17,870
Louisiana Gulf Coast	6,893	7,102	7,568	6,511	5,858	5,762	5,817	6,461	6,092	6,593	6,565	7,764
Arkansas, Louisiana Inland, etc	2,940	3,327	2,826	2,605	2,421	2,305	2,362	2,250	2,180	2,210	2,275	2,704
Rocky Mountain	4,350	5,075	5,490	5,495	5,202	4,770	4,018	3,453	3,143	2,711	3,088	3,865
California	20,116	20,954	20,148	19,402	18,286	17,069	15,326	13,896	13,796	13,920	14,871	15,625
Total: 1950	125,298	132,796	133,766	128,057	121,035	114,074	111,055	107,067	105,748	105,764	109,005	116,769
1949	116,938	126,054	127,443	125,351	121,602	114,041	111,217	104,879	101,799	103,287	104,707	111,443

[1] Includes stocks of finished gasoline at refineries and bulk terminals, and in pipelines.

The change in finished gasoline stocks, by quarters, in 1950 included a gain of 21.3 million barrels in the first quarter, an unusually large decline of 18.9 million in the second, a further decrease of 8.1 million in the third, and a substantial gain of 10.8 million barrels in the last.

Stocks of finished and unfinished gasoline combined increased from almost 111.5 million barrels on January 1, 1950, to 116.8 million on December 31. The principal changes, by refinery districts, were a decrease of 2.3 million barrels in the California district and gains of 1.8 million for Indiana-Illinois, 1.5 million for the East Coast, 1.3 million for Oklahoma-Kansas, 1.2 million for the Louisiana Gulf, and 1.1 million barrels for the Texas Gulf.

Stocks of finished gasoline and natural gasoline, used in computing the total demand for motor fuel, represented 43.7 days' supply at the end of 1950 compared with 50.0 days' supply at the end of 1949.

TABLE 64.—Days' supply of motor fuel on hand in the United States at end of month, 1948–50 [1]

Month	1948			1949			1950 [2]		
	Finished gasoline	Natural gasoline	Total motor fuel	Finished gasoline	Natural gasoline	Total motor fuel	Finished gasoline	Natural gasoline	Total motor fuel
January	46.5	2.1	48.6	49.3	2.8	52.1	50.0	3.2	53.2
February	44.8	2.0	46.8	47.1	2.8	49.9	47.9	3.1	51.0
March	40.9	1.9	42.8	45.1	2.8	47.9	45.3	2.8	48.1
April	38.8	2.1	40.9	42.2	2.6	44.8	40.6	2.7	43.3
May	36.7	2.1	38.8	39.1	2.5	41.6	36.8	2.7	39.5
June	34.8	2.2	37.0	38.9	2.6	41.5	35.1	2.7	37.8
July	33.4	2.3	35.7	36.3	2.7	39.0	33.2	2.8	36.0
August	32.9	2.4	35.3	35.1	2.7	37.8	33.5	2.9	36.4
September	32.7	2.5	35.2	35.6	2.9	38.5	33.2	2.9	36.1
October	33.4	2.4	35.8	36.7	2.7	39.4	34.6	2.9	37.5
November	35.9	2.4	38.3	38.9	2.8	41.7	37.5	2.8	40.3
December	44.1	2.6	46.7	46.8	3.1	49.9	40.9	2.8	43.7

[1] Stocks divided by the daily average total demand (domestic demand plus exports) for succeeding month.
[2] Preliminary figures.

Prices.—The average dealer's net price for Regular Grade gasoline (exclusive of tax) in 50 representative cities in the United States provides an index of gasoline prices at the wholesale level. This average price, according to the American Petroleum Institute, rose from 12.33 cents per gallon in 1947 to 14.55 cents in 1948, 15.05 cents in 1949, and 15.10 cents in 1950. The average service-station price, also reported by the American Petroleum Institute and including State and local taxes but not Federal tax, rose from 21.61 cents per gallon in 1947 to 24.38 cents in 1948 and 25.29 cents in 1949 and declined to 25.26 cents in 1950. Including the Federal tax of 1.50 cents per gallon, the total average price to the consumer for Regular Grade gasoline rose from 23.11 cents per gallon in 1947 to 25.88 cents in 1948 and 26.79 cents in 1949 and declined to 26.76 cents in 1950. There was no change in the Federal tax during these years, but the average State taxes rose from 4.61 cents per gallon in 1947 to 4.75 cents in 1948, 4.92 cents in 1949, and 5.09 cents in 1950. The average local (municipal and county) tax per gallon rose from 0.07 cent in 1947 to 0.09 cent in 1948 and 0.10 cent in 1949 and declined to 0.09 cent in 1950.

TABLE 65.—Average monthly prices of gasoline in the United States, 1949–50, in cents per gallon

[National Petroleum News]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1949													
Monthly average at refineries in Oklahoma, Grades 1 and 2 [1]	10.43	10.27	10.04	10.00	10.00	10.19	10.19	10.19	10.19	10.19	10.07	10.06	10.15
Average of 50 cities on 1st of month: [2]													
Dealer's net (ex. tax)	14.87	14.92	14.92	14.92	15.19	15.19	15.19	15.19	15.15	15.12	15.12	14.85	15.05
Service station (including State and local taxes only)	24.97	25.01	25.00	25.02	25.31	25.38	25.51	25.55	25.49	25.46	25.47	25.25	25.29
1950													
Monthly average at refineries in Oklahoma, Grade 2	10.06	10.06	9.79	9.81	10.06	10.67	10.30	10.46	10.55	10.56	10.53	10.45	10.32
Average of 50 cities on 1st of month: [2]													
Dealer's net (ex. tax)	14.82	14.80	14.75	14.64	14.98	15.05	15.09	15.43	15.34	15.43	15.43	15.43	15.10
Service station (including State and local taxes only)	25.21	25.19	25.03	24.89	25.16	25.21	25.37	25.70	25.50	25.31	25.12	25.39	25.26

[1] Grade 1, January–May; Grade 2, June–December 1949.
[2] American Petroleum Institute; compiled by The Texas Co.

OTHER REFINED PRODUCTS

KEROSINE

The domestic demand for kerosine increased noticeably in 1950 over 1949; however, greater production plus a slight draft on stocks and minor imports were adequate to meet this expanded market. Exports, of small volume in 1950, continued the decline evident since 1946. These salient factors for kerosine in 1950 differed from those of 1949, when both production and domestic demand were down sharply. Detailed statistics for kerosine in the 2 years are shown in table 66.

Kerosine production of 118,512,000 barrels in 1950 exceeded the 1949 total of 102,152,000 barrels by 16 percent. This increased output was due mainly to an 8-percent gain in crude runs at refineries, as the percentage yield for this fuel changed only slightly—from 5.2 percent in 1949 to 5.6 percent in 1950.

Substantial gains in production of kerosine were reported for most of the refinery districts in 1950. The increase in the Texas Gulf Coast, where about a third of the kerosine is made, was 23 percent, while in the Indiana-Illinois area, source of about a fifth of the total, the gain was 21 percent. The expansion in output for the East Coast was outstanding in 1950—27 percent over 1949. Production of kerosine in 1950 in three refinery districts—Oklahoma-Kansas, Texas Inland, and California—was below 1949.

TABLE 66.—Salient statistics of kerosine in the United States, 1949–50, by months and districts

Month and district	Production (thousand barrels)		Yield (percent)		Domestic demand (thousand barrels)		Stocks, end of period (thousand barrels)	
	1949	1950 [1]	1949	1950 [1]	1949	1950 [1]	1949	1950 [1]
By months:								
January	10,538	11,140	6.0	6.5	12,963	13,906	21,261	18,260
February	8,789	9,469	5.8	6.2	10,592	11,413	18,953	16,126
March	8,974	10,100	5.4	6.1	9,913	12,939	17,801	13,001
April	8,166	8,848	5.2	5.7	6,605	8,371	19,052	13,383
May	7,361	9,790	4.5	5.8	4,577	5,700	21,546	17,304
June	6,715	8,477	4.4	5.0	4,531	4,629	23,648	21,117
July	6,974	9,091	4.4	5.0	5,676	6,926	24,826	23,151
August	7,175	9,828	4.4	5.3	6,315	7,035	25,490	25,803
September	8,093	9,989	5.0	5.5	6,799	7,920	26,650	27,677
October	9,339	10,264	5.5	5.4	8,269	9,486	27,609	28,292
November	9,273	10,255	5.7	5.6	11,454	12,737	25,267	25,526
December	10,755	11,261	6.3	5.8	14,978	16.817	20,888	19,723
Total	102,152	118,512	5.2	5.6	102,672	117,879	20,888	19,723
By districts:								
East Coast	10,446	13,304	3.6	3.9	(2)	(2)	9,252	8,140
Appalachian	3,082	3,808	5.4	6.3			448	512
Indiana-Illinois-Kentucky, etc	19,836	23,996	6.0	6.3			4,109	4,212
Oklahoma, Kansas, etc	7,217	6,400	4.6	3.6			893	973
Texas Inland	4,466	4,242	5.5	5.4			450	427
Texas Gulf Coast	31,026	38,103	6.8	8.0			3,061	2,968
Louisiana Gulf Coast	17,380	20,073	10.9	11.6			1,207	1,275
Arkansas, Louisiana Inland, etc	2,543	2,677	9.1	9.9			345	256
Rocky Mountain	1,924	2,080	3.0	2.9			291	349
California	4,232	3,829	1.3	1.2			832	611
Total	102,152	118,512	5.2	5.6	102,672	117,879	20,888	19,723

[1] Preliminary figures.
[2] Figures not available.

The domestic demand for kerosine in 1950—117,879,000 barrels—was 15 percent over 1949 requirements—102,672,000 barrels. This expanded market for kerosine in 1950 was due largely to colder weather and the greater need for range oil. In 1949 the domestic demand for kerosine declined from the preceding year in the first three quarters and made only a nominal gain in the final months of the year, while in 1950 a higher demand than in 1949 was evident throughout the year. Domestic demand in the opening quarters of 1950 was 14 and 19 percent, respectively, above comparative demand in 1949; however, it was below the corresponding 1948 figures. The domestic demand for kerosine in the third quarter of 1950 was 16 percent above the similar period of 1949, while the gain for the closing 3 months of the year was 13 percent. The rate of expansion in the domestic demand for kerosine evident in 1950 did not, however, continue into the first quarter of 1951, when the gain was only 10 percent over the corresponding period of 1950.

Exports of kerosine have declined from a peak of 8,637,000 barrels in 1946 to 2,533,000 in 1949 and 2,043,000 in 1950. Canada (477,000 barrels) and the United Kingdom (339,000 barrels) received the larger shares of the 1950 exports of kerosine. Exports to the various foreign countries are shown in table 88.

Stocks of kerosine reported for the year end have declined somewhat in recent years from 23,941,000 barrels in 1948 to 20,888,000 in 1949 and 19,723,000 at the close of 1950. Kerosine stored at petroleum refineries, representing about 60 percent of the total, has declined from 14,110,000 barrels in 1948 to 12,030,000 in 1949 and 11,315,000 in the final month of 1950, while bulk terminal and pipeline supplies have also dropped from 9,831,000 barrels in 1948 to 8,858,000 in 1949 and down to 8,408,000 at the 1950 year end. Kerosine in storage on December 31, 1950, was equivalent to a 39-day domestic supply at the January 1951 rate of consumption, which compares with a 47-day reserve at the end of 1949 and a 57-day supply for 1948.

Over 41 percent of the kerosine stocks are reported from the East Coast area, and there the quantity declined by 12 percent in 1950, while about a fifth of the volume is carried in the Indiana-Illinois refinery district, where there was a gain of about 3 percent. The only other section with an important kerosine inventory—15 percent of the national total—is the Texas Gulf Coast, and that area showed a 3-percent shrinkage in these stocks in 1950.

The annual survey conducted by the Bureau of Mines showed a 15-percent increase in the market for kerosine in 1950 over 1949 requirements. The quantity reported was not only of record volume but was also in contrast to a 9-percent decline in 1949 compared with 1948 sales to consumers. Kerosine sold for range oil in 1950 was up by a fifth over the 1949 total and represented about 68 percent of the market compared to a 65-percent share in 1949. Deliveries of kerosine for tractor fuel in 1950 continued the downward trend of recent years, owing largely to a pronounced shift to gasoline and liquefied petroleum gas for this farm use. The 1950 quantity was lower by 15 percent compared with 1949 requirements, and the relative volume dropped from 5 percent of the kerosine total in 1949 to 4 percent in 1950. Kerosine reported as sold for all other uses, such as lamp fuel, orchard heating, weed burning, dust control, jet fuel, etc., increased by 9 percent in 1950 over the 1949 total.

Kerosine prices, which dropped noticeably in 1949, changed very little in 1950. The quotation for 41°–43° gravity, water-white kerosine at refineries in Oklahoma rose gradually throughout 1950 from 8.52 cents a gallon in January to 9.23 cents in December, averaging 8.84 cents for the year compared with 8.58 cents for 1949. Kerosine, including No. 1 fuel oil, at New York Harbor rose from a low of 9 cents a gallon in May 1950 to 10.15 cents in the final 2 months of the year, and the average price for 1950 was 9.46 cents a gallon against 9.12 cents for 1949.

The average tank-wagon prices for kerosine at Chicago and New York changed only fractionally in 1950 compared with 1949. The average price for 1950 at Chicago was 15.36 cents a gallon compared with 15.33 cents in 1949 and at New York 12.94 cents in 1950 and 12.93 cents in 1949.

TABLE 67.—Sales of kerosine in the United States, 1949–50, by States and uses

[Thousands of barrels]

District [1] and State	Sold as range oil		Tractor fuel		All other uses		Total	
	1949	1950	1949	1950	1949	1950	1949	1950
District 1:								
Connecticut	4,056	4,902	23	15	177	167	4,256	5,084
Delaware	629	625	3	1	32	29	664	655
District of Columbia	324	251	3	1	124	195	451	447
Florida	1,386	1,526	91	74	794	804	2,271	2,404
Georgia	1,105	1,702	178	179	544	584	1,827	2,465
Maine	2,172	2,950	19	18	146	215	2,337	3,183
Maryland	1,227	1,310	19	37	582	668	1,828	2,015
Massachusetts	12,794	12,687	67	44	497	496	13,358	13,227
New Hampshire	1,235	1,536	14	11	78	68	1,327	1,615
New Jersey	4,291	4,874	25	19	970	1,037	5,286	5,930
New York	9,169	9,709	97	72	824	954	10,090	10,735
North Carolina	3,082	3,769	280	241	1,359	1,884	4,721	5,894
Pennsylvania	2,179	2,521	135	126	1,262	1,415	3,576	4,062
Rhode Island	2,705	2,897	14	12	98	104	2,817	3,013
South Carolina	1,183	1,957	58	42	952	1,060	2,193	3,059
Vermont	778	809	13	3	71	63	862	875
Virginia	1,530	1,615	35	27	853	924	2,418	2,566
West Virginia	191	234	3	2	249	243	443	479
Total	50,036	55,874	1,077	924	9,612	10,910	60,725	67,708
District 2:								
Illinois	2,562	3,182	361	357	1,883	1,967	4,806	5,506
Indiana	1,141	1,905	176	129	2,401	2,155	3,718	4,189
Iowa	806	1,342	526	402	1,176	1,066	2,508	2,810
Kansas	335	412	219	208	356	410	910	1,030
Kentucky	356	489	66	52	736	808	1,158	1,349
Michigan	832	2,387	257	191	1,888	1,986	2,977	4,564
Minnesota	543	1,385	123	90	440	503	1,106	1,978
Missouri	747	1,456	53	51	715	774	1,515	2,281
Nebraska	356	504	92	97	152	160	600	761
North Dakota	166	485	89	82	91	122	346	689
Ohio	954	1,554	74	74	632	704	1,660	2,332
Oklahoma	707	815	138	165	872	959	1,717	1,939
South Dakota	141	498	95	87	87	86	323	671
Tennessee	1,137	1,309	145	71	784	971	2,066	2,351
Wisconsin	604	1,172	219	191	587	671	1,410	2,034
Total	11,387	18,895	2,633	2,247	12,800	13,342	26,820	34,484
District 3:								
Alabama	505	550	96	72	695	765	1,296	1,387
Arkansas	755	854	125	113	676	774	1,556	1,741
Louisiana	574	615	162	159	726	748	1,462	1,522
Mississippi	358	441	149	137	648	673	1,155	1,251
New Mexico	134	162	7	10	96	78	237	250
Texas	1,883	1,973	450	355	2,831	3,462	5,164	5,790
Total	4,209	4,595	989	846	5,672	6,500	10,870	11,941
District 4:								
Colorado	85	149	68	53	58	41	211	243
Idaho	24	25	6	3	23	12	53	40
Montana	61	109	49	45	62	77	172	231
Utah	11	14	6	4	10	9	27	27
Wyoming	54	66	12	8	168	166	234	240
Total	235	363	141	113	321	305	697	781
District 5:								
Arizona	10	6			99	49	109	55
California	306	116			2,356	2,755	2,662	2,871
Nevada	2	1			34	8	36	9
Oregon	32	12			267	193	299	205
Washington	27	7			416	223	443	230
Total	377	142			3,172	3,228	3,549	3,370
Total United States	66,244	79,869	4,840	4,130	31,577	34,285	102,661	118,284

[1] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

TABLE 68.—Sales of range oil in the United States, 1948–50, by States

[Thousands of barrels]

State	1948	1949	1950	
			Total	Percent of total
Massachusetts	14,798	13,486	13,505	14.3
New York	10,732	9,590	10,386	11.0
Illinois	5,485	5,002	6,184	6.5
New Jersey	6,040	4,701	5,426	5.7
Connecticut	5,345	4,361	5,238	5.5
Michigan	1,881	2,267	3,979	4.2
North Carolina	2,325	3,141	3,872	4.1
Maine	2,674	2,280	3,093	3.3
Rhode Island	3,311	2,811	3,058	3.2
Pennsylvania	2,816	2,407	2,838	3.0
Wisconsin	1,762	1,744	2,526	2.7
Indiana	1,082	1,709	2,516	2.7
Minnesota	1,825	1,435	2,454	2.6
Missouri	1,554	1,469	2,308	2.4
Iowa	1,525	1,555	2,188	2.3
Texas	2,025	1,964	2,064	2.2
South Carolina	956	1,244	2,022	2.1
Ohio	1,385	1,251	1,926	2.0
Georgia	1,363	1,190	1,797	1.9
Virginia	1,096	1,628	1,723	1.8
New Hampshire	1,673	1,299	1,636	1.7
Florida	1,662	1,460	1,601	1.7
Tennessee	923	1,188	1,370	1.5
Maryland	1,291	1,234	1,336	1.4
Arkansas	872	892	964	1.0
Oklahoma	660	814	923	1.0
All other	7,102	6,401	7,729	8.2
Total	84,163	78,523	94,662	100.0

California oil companies shipped 25,000 barrels of kerosine by rail and truck to other parts of the country in 1950, a gain over the 1949 total of 19,000 barrels. There were no tanker shipments of kerosine from California to the east coast in either 1949 or 1950. The Pacific Coast area received 1,000 barrels of kerosine in 1950 by rail and truck but none in 1949.

Barge shipments of kerosine from the Gulf coast to points on the Mississippi River and its tributaries increased from 5,783,000 barrels in 1949 to 8,587,000 in 1950, according to monthly reports published by the Oil and Gas Division, United States Department of the Interior. Quantities originating in Texas totaled 2,051,000 barrels in 1950 compared with 912,000 in 1949; in Louisiana, 5,457,000 barrels in 1950 and 3,634,000 in 1949; and in Arkansas and Mississippi, 1,079,000 barrels in 1950 and 1,237,000 in 1949. Most of the kerosine handled in this river traffic is unloaded at terminals in district 2, and quantities terminated in that area increased from 5,270,000 barrels in 1949 to 7,941,000 in 1950. District 3 received 513,000 barrels in 1949 and 629,000 in 1950, while 17,000 barrels of kerosine reached district 1 over these inland waters in 1950 compared with none in 1949.

Kerosine shipped by tanker and barge from the Gulf coast to ports on the east coast increased from 35,045,000 barrels in 1949 to 41,756,000 in 1950. Quantities loaded in Texas expanded from 24,862,000 barrels in 1949 to 30,784,000 in 1950, while there was little change in the amounts credited to Louisiana—10,183,000 barrels in 1949 and 10,962,000 in 1950.

TABLE 69.—Monthly average prices of kerosine in the United States, 1949–50

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1949													
41°-43° gravity, water-white kerosine at refineries, Oklahoma ...cents per gallon	9.33	9.24	8.98	8.72	8.69	8.52	8.35	8.16	8.15	8.25	8.25	8.31	8.58
Kerosine (and/or No. 1 fuel oil) at New York Harbor cents per gallon	10.30	10.30	9.93	9.12	8.61	8.45	8.45	8.45	8.88	9.20	8.83	8.90	9.12
Kerosine, tank-wagon at Chicago ...do	16.02	16.10	16.07	15.60	15.60	15.43	15.10	15.10	14.85	14.70	14.70	14.71	15.33
Kerosine, tank-wagon at New York City [1] ...do	14.30	13.99	13.46	12.97	12.45	12.30	12.30	12.30	12.45	12.81	12.90	12.90	12.93
1950													
41°-43° gravity, water-white kerosine at refineries, Oklahoma cents per gallon	8.52	8.75	8.75	8.75	8.75	8.69	8.66	8.82	9.06	9.06	9.06	9.23	8.84
Kerosine (and/or No. 1 fuel oil) at New York Harbor cents per gallon	9.50	9.15	9.05	9.01	9.00	9.20	9.21	9.52	9.65	9.92	10.15	10.15	9.46
Kerosine, tank-wagon at Chicago ...do	15.09	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.67	15.80	15.36
Kerosine, tank-wagon at New York City [1] ...do	13.41	12.84	12.70	12.53	12.28	12.50	12.50	12.85	13.10	13.42	13.60	13.60	12.94

[1] Manhattan and Queens.

In 1950, as in 1949, there were numerous changes in the tanker rates for kerosine and other petroleum products transported from the Gulf Coast area to New York. A freight rate of 36.1 cents a barrel for kerosine carried over this route as of December 31, 1949, dropped to a low of 18.1 cents a barrel on February 13, 1950. The charge fluctuated somewhat thereafter; but a sharp upward trend, especially after the midyear, brought this transportation cost to 88.2 cents a barrel on December 26, 1950, and an average of 37.8 cents a barrel for all of 1950 compared with 25.6 cents in 1949.

DISTILLATE FUEL OIL

Although production and imports of distillate fuel oil, including Diesel fuel, in 1950 were well above comparative quantities in 1949, it was necessary to draw on stocks to satisfy a greatly increased domestic demand and slightly higher exports. This was the first draft on distillate-fuel-oil stocks since 1947. The supply and demand situation for distillate fuel oils was entirely different in 1949, when—with slightly lower domestic requirements and a greatly contracted export market compared with 1948—fuel-oil stocks were increased, even though the over-all supply from production, imports, and transfers was considerably less. Salient statistics for distillate fuel oil by months and by refinery districts in 1949 and 1950 are shown in table 70.

The domestic demand for distillate grades of fuel oil, which declined 3 percent in 1949 compared with 1948, increased to 394,715,000 barrels in 1950—a 20 percent gain over the 1949 total of 329,278,000 barrels. This expanded domestic market for light fuel oils was evident throughout 1950. A 15-percent gain over 1949 in the first quarter of 1950 was followed by a 30-percent increase in the April–June period. These higher quarterly demands for distillate in 1950 are in contrast to pronounced declines—5 and 18 percent, respectively—in the opening quarters of 1949 compared with 1948. There was a 17-percent increase in the domestic demand for light fuel oils in the third quarter of 1950, which compares with a 10 percent gain over the preceding year in the same period of 1949, while in the closing 3 months of 1950 consumption was 22 percent above the corresponding 1949 figure, which in turn was only 1 percent over the 1948 total. This active domestic market for distillate fuel oils continued into 1951, with the total for the first quarter about 22 percent over the 1950 demand.

According to the annual survey made by the Bureau of Mines, sales of light fuel oils for all principal uses showed important gains in 1950 over 1949, except the quantity sold to vessels, which was lower by 2 percent. The railroads, with their revenue-paying freight up by 12 percent, bought 26 percent more light fuel oils, mostly Diesel grades, in 1950 than in 1949, while heavy industries—smelters, mines, and manufacturing plants—with a big expansion in their activities, increased their distillate requirements by 40 percent in the same period. With more degree days in 1950 and a 15-percent increase in domestic burner installations, the sales of heating oils were up by 16 percent over the 1949 total, and the quantity of No. 1 fuel oil delivered for range burners was a fifth larger in reported volume in 1950. Gas and electric power utilities purchased 5 percent more distillate fuel oils in 1950 then in 1949 and the military services required a 7-percent greater quantity. Light fuel oils sold for various miscellaneous uses

TABLE 70.—Salient statistics of distillate fuel oil in the United States, 1949–50, by months and districts

[Thousands of barrels]

Month and district	Production		Yield (percent)		Transfers, east of California [1]		Imports		Exports		Domestic demand		Stocks, end of period	
	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]
By months:														
January	33,108	32,489	18.7	18.9	283	229	116	61	1,546	876	41,661	43,406	61,729	63,932
February	28,192	28,729	18.5	19.0	238	192	--------	30	1,246	1,193	34,976	39,484	53,937	52,206
March	29,013	29,070	17.5	17.7	245	204	2	53	1,685	1,152	32,589	42,604	48,923	37,777
April	25,482	29,301	16.3	18.8	254	193	--------	98	1,271	1,033	22,157	28,806	51,231	37,530
May	25,311	30,920	15.6	18.2	217	196	280	90	866	874	17,792	25,123	58,381	42,739
June	23,294	31,112	15.1	18.4	206	203	382	225	869	895	16,664	19,705	64,730	53,679
July	26,141	32,253	16.2	17.8	218	204	219	508	694	1,116	19,061	23,864	71,553	61,664
August	28,390	33,765	17.1	18.1	209	223	195	526	1,034	967	23,276	26,785	76,037	68,426
September	29,999	35,392	18.4	19.5	194	209	245	168	832	1,061	22,430	24,864	83,213	78,270
October	31,024	37,723	18.3	19.8	214	221	179	88	846	1,339	23,141	29,320	90,643	85,643
November	28,871	36,530	18.0	20.0	200	226	145	237	875	1,112	30,772	35,411	88,212	86,113
December	32,000	41,628	18.6	21.3	223	237	62	256	531	943	44,759	55,343	[3]75,207	71,948
Total	340,825	398,912	17.5	19.0	2,701	2,537	1,825	2,340	12,295	12,561	329,278	394,715	75,207	71,948
By districts:														
East Coast	59,375	73,482	20.4	21.7	--------	--------	(4)	(4)	(4)	(4)	(4)	(4)	23,780	21,986
Appalachian	6,362	7,785	11.2	12.9	--------	--------							1,012	794
Indiana, Illinois, Kentucky, etc	48,437	62,485	14.6	16.6	426	410							10,511	10,251
Oklahoma, Kansas, etc	30,056	37,920	19.2	21.3	495	418							5,360	7,887
Texas Inland	8,711	10,690	9.9	13.7	1,032	961							899	1,032
Texas-Gulf Coast	87,540	101,938	18.9	21.4	376	393							14,369	12,443
Louisiana-Gulf Coast	35,857	37,709	22.5	21.7	130	91							4,178	3,621
Arkansas, Louisiana Inland, etc	4,098	5,325	14.6	19.6	34	46							560	861
Rocky Mountain	11,288	13,852	17.7	19.3	208	218							1,557	1,948
California	49,101	47,726	15.0	14.9	--------	--------							12,981	11,125
Total	340,825	398,912	17.5	19.0	2,701	2,537	1,825	2,340	12,295	12,561	329,278	394,715	75,207	71,948

[1] Figures represent crude oil used as fuel on pipelines, which is considered part of the demand for distillate. No transfers reported from California district for 1949 and 1950.
[2] Preliminary figures.
[3] 75,435 barrels on new basis comparable with 1950.
[4] Figures not available.

TABLE 71—Sales of distillate fuel oil [1] in the United States, 1946–50, by uses

[Thousands of barrels]

Use	1946	1947	1948	1949	1950
Railroads	17,570	23,619	31,006	38,604	48,703
Vessels (including tankers)	12,064	14,475	14,511	13,121	12,872
Gas and electric power plants	10,581	14,216	14,856	12,550	13,207
Smelters, mines, and manufacturing industries	21,317	24,489	29,932	26,424	37,121
Heating oils	139,637	178,359	200,024	190,387	220,947
Fuel oil (No. 1) sold as range oil	8,459	11,632	13,534	12,279	14,793
U. S. Army, Navy, Air Force, and Coast Guard	9,385	5,176	9,071	6,109	6,553
Oil company fuel	1,890	2,191	3,625	4,151	5,692
Miscellaneous uses	18,647	23,857	25,414	25,571	35,418
Total United States	239,550	298,014	341,973	329,196	395,306
Exports and shipments to U. S. Territories and possessions	29,487	29,877	21,293	12,295	12,653
Total	269,037	327,891	363,266	341,491	407,959

[1] Includes Diesel fuel.

such as fuel for heavy equipment, dust and insect control, weed burning, orchard heating, etc., showed a 39-percent increase. Oil companies use only comparatively small amounts of distillates in their various operations; however with their expanded activities in 1950, the consumption of these light oils was greater by 37 percent than reported in 1949.

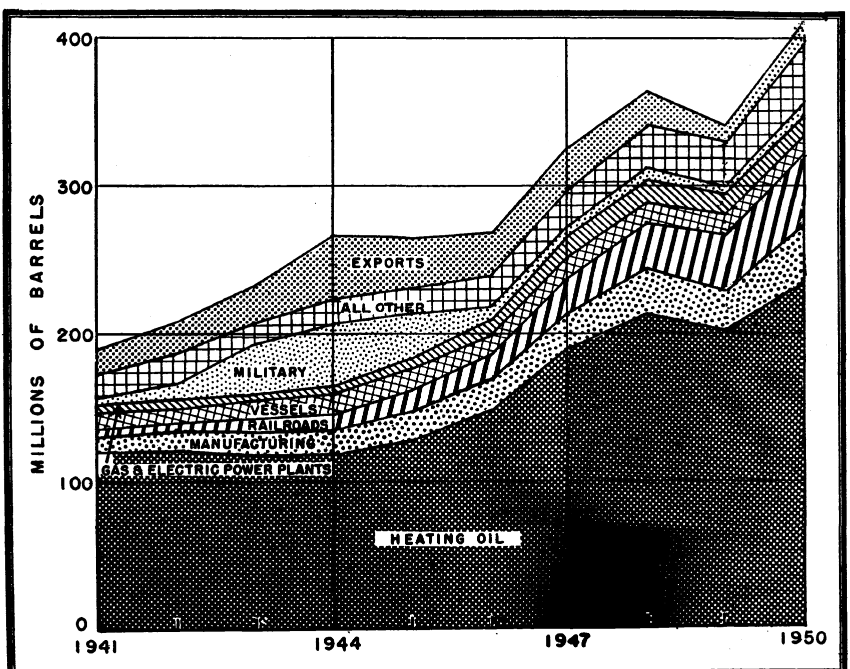

FIGURE 10.—Sales of distillate fuel oil, including Diesel oil and range oil, in the United States, 1941–50, by uses.

TABLE 72.—Sales of distillate fuel oil [1] in the United States, 1946–50, by States

[Thousands of barrels]

District [2] and State	1946	1947	1948	1949	1950
District 1:					
Connecticut	6,784	8,635	10,487	9,510	11,067
Delaware	570	783	866	1,013	1,285
District of Columbia	2,039	2,733	2,789	2,246	2,433
Florida	3,271	3,760	4,068	3,824	4,648
Georgia	1,564	1,956	2,593	2,604	3,202
Maine	1,440	2,266	2,638	2,576	3,496
Maryland	5,271	7,551	8,442	7,691	8,981
Massachusetts	12,865	19,290	20,919	19,741	22,769
New Hampshire	1,001	1,387	1,455	1,945	2,765
New Jersey	22,201	26,011	28,755	26,993	30,521
New York	33,376	38,888	45,902	45,252	52,173
North Carolina	2,177	2,552	3,220	3,491	4,354
Pennsylvania	14,781	19,916	22,198	20,849	28,266
Rhode Island	3,097	3,389	3,413	3,408	4,116
South Carolina	1,144	1,427	1,662	1,630	1,854
Vermont	699	816	875	1,054	1,117
Virginia	3,146	4,539	5,319	5,380	7,855
West Virginia	374	475	585	554	651
Total	115,800	146,374	166,186	159,761	191,553
District 2:					
Illinois	16,635	20,906	21,622	19,582	26,320
Indiana	3,830	6,153	8,429	8,080	10,776
Iowa	5,149	6,099	7,435	7,610	8,925
Kansas	2,282	2,881	4,094	3,185	4,527
Kentucky	1,158	1,586	1,980	1,956	2,274
Michigan	8,542	12,277	13,713	14,562	18,493
Minnesota	7,120	9,327	10,229	10,094	12,448
Missouri	6,362	7,072	8,110	6,822	7,815
Nebraska	2,716	3,340	3,744	3,386	3,707
North Dakota	916	1,067	1,312	1,616	1,939
Ohio	5,054	7,479	10,120	9,442	12,059
Oklahoma	701	1,084	1,571	1,929	1,928
South Dakota	909	1,338	1,434	1,510	1,893
Tennessee	1,559	2,018	2,143	2,125	3,062
Wisconsin	6,106	8,203	8,609	8,279	10,285
Total	69,039	90,830	104,545	100,178	126,451
District 3:					
Alabama	1,473	1,937	2,493	2,340	2,692
Arkansas	1,363	1,733	1,838	2,162	2,414
Louisiana	2,762	3,274	4,268	4,021	4,619
Mississippi	777	912	1,002	1,010	1,271
New Mexico	570	708	653	715	950
Texas	10,686	8,035	10,120	9,238	12,790
Total	17,631	16,599	20,374	19,486	24,736
District 4:					
Colorado	1,517	1,724	1,976	1,683	1,831
Idaho	787	1,034	1,570	1,562	1,770
Montana	1,381	1,660	1,810	1,965	2,478
Utah	839	1,223	1,448	1,474	2,001
Wyoming	537	643	1,600	1,504	1,732
Total	5,061	6,284	8,404	8,188	9,812
District 5:					
Arizona	1,126	1,173	1,342	1,021	1,020
California	17,840	20,481	22,573	21,232	19,212
Nevada	766	951	1,363	1,772	1,843
Oregon	4,592	5,720	6,181	6,343	7,725
Washington	7,695	9,602	11,005	11,215	12,954
Total	32,019	37,927	42,464	41,583	42,754
Total United States	239,550	298,014	341,973	329,196	395,306

[1] Includes Diesel fuel oil.
[2] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.

Exports plus shipments to United States Territories of distillate fuel oil in 1950 (12,561,000 barrels) differed little from the 1949 total (12,295,000 barrels). Quantities credited to Canada were 2,746,000 barrels in 1949 and 5,401,000 in 1950; the United Kingdom, 2,314,000 in 1949, and 1,167,000 in 1950; France, 352,000 in 1949 and 750,000 in 1950; Sweden, 675,000 in 1949 and 590,000 in 1950; and Denmark, 587,000 in 1949 and 219,000 in 1950. Exports and shipments of distillate fuel oil to the Territories in 1950 are given, by destination, in table 88.

The production of distillate fuel oil increased from 340,825,000 barrels in 1949 to 398,912,000 in 1950—a 17-percent gain. This greater output of light fuel oils at refineries resulted from larger runs of crude in 1950—8 percent over 1949—and a greater yield—19 percent in 1950 compared with 17.5 percent in 1949. Distillate fuel oil produced at refineries in 1950 represented 98 percent of the total supply, compared with 99 percent in 1949.

All refinery districts produced a greater volume of distillate fuel oil in 1950 than in 1949, except the California area, where there was a 3-percent decline. In the Texas Gulf district, source of a quarter of the light fuel oils, the output increased 16 percent. The production in other important source areas—the East Coast and the Indiana-Illinois-Kentucky refinery districts—rose 24 and 29 percent, respectively. Gains in distillate production in other parts of the country ranged from 5 percent in the Louisiana Gulf to 30 percent in the Arkansas-Louisiana Inland district.

Some light crude oils are used by pipeline companies as fuel, and such quantities are entered into the fuel-oil account as "transfers." The volume of these transfers has declined somewhat from 3,543,000 barrels in 1948 to 2,701,000 in 1949 and to 2,537,000 in 1950 and at present represents less than 1 percent of the available light-fuel-oil supply. The larger share of the transfers is reported from the Middle Western areas, while none is credited to the East Coast, Appalachian, and California districts.

Only a small portion—less than 1 percent of the distillate-fuel-oil market—is supplied from imports; these have varied from 2,546,000 barrels in 1948 to 1,825,000 in 1949 and 2,340,000 in 1950. The more important quantities were received from Netherlands Antilles (926,000 barrels in 1949 and 1,068,000 in 1950); Saudi Arabia (352,000 barrels in 1949 and 695,000 in 1950); and the State of Bahrein (308,000 barrels in 1949 and 774,000 in 1950).

Year-end distillate-fuel-oil stocks of 71,948,000 barrels for 1950 and 75,207,000 for 1949 are not comparable; however, an upward revision of 228,000 barrels in the 1949 total brings it onto the same basis as the 1950 figure. The light-fuel-oil stocks at the close of 1950 were reported as 41,632,000 barrels held in storage at refineries and 30,316,000 at bulk terminals and in pipelines. The distillate fuel oil on hand at the end of 1950 was equivalent to a 39-day domestic supply at the January 1951 rate of daily demand.

The tanker movement of distillate fuel oil from California to the East coast has fluctuated widely in recent years—from 1,177,000 barrels in 1948 down to 66,000 in 1949 and then sharply upward to 1,554,000 barrels in 1950. Virtually all the light fuel oil shipped over this route in 1950 was moved during the second half of the year and possibly was an effort at the time to find a new market for this product. The traffic did not continue into 1951, as the total was only 17,000 barrels for the opening quarter of the year. There are also some overland movements of distillate fuel oil by rail and truck from the California area to other Western States, totaling 849,000 barrels in 1949 and 606,000 in 1950. The Pacific coast market in turn received 1,095,000 barrels of light fuel oil by overland routes from other States in 1950 compared with receipts of 1,413,000 barrels in 1949.

Shipments of distillate fuel oil by tanker and barge from the Gulf coast to terminals on the Atlantic coast increased from 102,147,000 barrels in 1949 to 115,328,000 in 1950, according to published records of the Oil and Gas Division, United States Department of the Interior. Most of the increase in this traffic shows up in the quantities originating in Texas—93,600,000 barrels in 1950 compared with 80,748,000 in 1949—while there was little change in the Louisiana portion—21,728,000 barrels in 1950 against 21,399,000 in 1949.

Official records covering the barge movement of distillate fuel oil from the Gulf Coast area up the Mississippi River and its tributaries to markets in districts 1, 2, and 3 show that the quantity doubled from 4,796,000 barrels in 1949 to 9,593,000 in 1950. The light fuel oil in these shipments credited to Texas about tripled from 1,209,000 barrels in 1949 to 3,332,000 in 1950, while there was also a large gain in the Louisiana total—5,425,000 barrels in 1950 compared with 2,961,000 in 1949. Only a relatively small share came from Arkansas and Mississippi—626,000 barrels in 1949 and 836,000 in 1950. Most of this distillate fuel oil was unloaded in district 2, where the quantity increased from 4,421,000 barrels in 1949 to 9,122,000 in 1950. Relatively small amounts were terminated in district 3—306,000 barrels in 1949 and 304,000 in 1950—and in district 1—69,000 barrels in 1949 and 167,000 in 1950.

The tanker rate for No. 2 distillate fuel oil carried on the Gulf coast–New York route has been changed frequently in recent years. A freight charge of 37.8 cents a barrel quoted at the close of 1949 gave way to 18.9 cents a barrel by February 13, 1950—the low for the year. There was a sharp upward trend during the following months until the charge reached a high of 93.2 cents a barrel on December 26, 1950. The weighted average tanker rate for this run was 39.5 cents for 1950 compared with 27.3 cents for 1949.

Prices of distillate, which declined somewhat in 1949, trended upward slightly in 1950. The quotation for No. 2 straw fuel oil at refineries in Oklahoma was lowered slightly in the early summer season but after the midyear rose gradually to 8.46 cents a gallon in December 1950 and averaged 8.13 cents for the year compared with 7.73 cents in 1949. The price of No. 2 at New York Harbor declined to a low of 7.75 cents a gallon in April 1950 and then was slowly pushed up to 9.15 cents in the final 2 months, averaging 8.35 cents for the year compared with 8.17 cents for 1949.

Diesel oil at shore plants around New York Harbor, quoted at 8.97 cents a gallon in January 1950, dipped to 8.15 cents in April. The trend thereafter was steadily upward to 9.55 cents in the final months of the year, with 8.80 cents a gallon the 1950 average compared with 8.76 cents in 1949. Diesel oil sold for ships' bunkers varied less in

TABLE 73.—Monthly average prices of distillate fuel oil and Diesel fuel in the United States, 1949–50

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1949													
No. 2 Straw fuel oil at refineries, Oklahoma cents per gallon	8.71	8.53	8.11	7.76	7.50	7.40	7.25	7.30	7.42	7.56	7.56	7.63	7.73
No. 2 fuel oil at New York Harbor do	9.10	8.90	8.38	7.83	7.49	7.50	7.50	7.72	8.39	8.59	8.30	8.40	8.17
Diesel oil, shore plants, New York Harbor do	9.55	9.55	9.33	8.67	8.37	7.90	7.90	8.11	8.79	9.00	9.00	9.00	8.76
Diesel oil for ships:													
New York dollars per barrel	4.00	4.00	3.79	3.56	3.40	3.40	3.40	3.46	3.64	3.70	3.70	3.70	3.65
New Orleans do	3.63	3.63	3.54	3.27	3.11	3.11	3.11	3.17	3.32	3.35	3.35	3.35	3.33
San Pedro do	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35
1950													
No. 2 Straw fuel oil at refineries, Oklahoma cents per gallon	7.85	8.03	8.06	8.03	7.94	7.92	7.96	8.15	8.37	8.38	8.38	8.46	8.13
No. 2 fuel oil at New York Harbor do	8.37	7.94	7.85	7.75	7.87	8.10	8.11	8.43	8.60	8.90	9.15	9.15	8.35
Diesel oil, shore plants, New York Harbor do	8.97	8.46	8.37	8.15	8.31	8.53	8.56	8.84	9.00	9.31	9.55	9.55	8.80
Diesel oil for ships:													
New York dollars per barrel	3.69	3.53	3.47	3.36	3.40	3.48	3.48	3.56	3.69	3.80	3.90	3.90	3.60
New Orleans do	3.35	3.35	3.30	3.22	3.24	3.28	3.28	3.36	3.49	3.49	3.49	3.49	3.36
San Pedro do	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.35	3.43	3.44	3.44	3.37

price in 1950 compared with 1949 than did other distillate-fuel-oil grades; the average quotation at New York Harbor for 1950—$3.60 a barrel—was down slightly from the 1949 average—$3.65 a barrel. Ships' Diesel oil at New Orleans averaged $3.36 a barrel in 1950 compared with an average price of $3.33 in 1949, while the average price at San Pedro was $3.37 a barrel in 1950 and $3.35 in 1949.

The Bureau of Labor Statistics, United States Department of Labor, publishes average monthly retail prices of various fuels for a number of cities. The 1950 average price of No. 2 distillate in New York—11.72 cents a gallon—was only slightly above the 1949 average—11.36 cents. The 1950 price, starting at 12.02 cents a gallon in January, reached a low of 11 cents in the late spring and then gradually increased to a December quotation of 12.63 cents a gallon. The price of No. 2 grade at Chicago rose steadily from 12.24 cents a gallon in January 1950 to 13.06 cents in the final quarter of the year—an annual average of 12.64 cents compared with 12.51 cents for 1949.

RESIDUAL FUEL OIL

The demand for residual grades of fuel oil both for domestic use and for export rose sharply in 1950 compared with 1949. As there was no corresponding increase in production, it was necessary to make a heavy draft on stocks and to greatly increase imports and transfers to supply these expanded markets. Comparatively, the lower production of residual fuel oil in 1949 resulted in only a nominal withdrawal from stocks, since domestic and export demand was also lower and there was a considerable increase in imports. Detailed statistics for residual fuel oil in 1949 and 1950, by months and by refinery districts, are shown in table 74.

The domestic demand for heavy fuel oils reached a record in 1950; requirements of 552,944,000 barrels for the year were about 12 percent over the 1949 total (496,021,000 barrels). This important expansion in the domestic market for residual grades is in contrast to small annual declines in 1948 and 1949. The gains in the first and second quarters of 1950—11 and 14 percent, respectively, compared with the preceding year—are in contrast to losses in the opening quarters of 1949. A 13-percent increase over 1949 in the indicated demand for the third quarter of 1950 compares with a 1-percent gain for the similar period between 1948 and 1949, while in the final 3 months the expansion was only 8 percent against a 10-percent gain over the preceding year for the final period of 1949. This improved domestic market for heavy fuel oils showed a slight leveling off in the initial quarter of 1951—7 percent up from 1950 in contrast to a 11-percent gain in the same period of 1950 compared with 1949.

A review of the sales of residual fuel oils in 1950, as reported in a survey made by the Bureau of Mines, shows substantial increases for all important uses except the railroads, which, with their rapidly growing consumption of light Diesel grades, bought 4 percent less heavy fuel oils in 1950 than in 1949. Heavy bunker-oil sales, which have dropped in recent years, turned upward again in 1950, with a 4-percent gain over the 1949 total. In spite of a slightly lower price for bituminous coal at the mines and generally higher prices for heavy fuel oils, both the public utilities and the manufacturing

TABLE 74.—Salient statistics of residual fuel oil in the United States, 1949–50, by months and districts

[Thousands of barrels]

Month and district	Production		Yield (percent)		Transfers [1] East of California		Transfers [1] California		Imports		Exports		Domestic demand		Stocks, end of period	
	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]
By months:																
January	41, 999	37, 491	23. 8	21. 9	300	252	278	283	5, 131	10, 101	1, 047	1, 178	48, 097	51, 334	62, 585	55, 808
February	35, 904	32, 818	23. 5	21. 7	265	273	226	100	4, 296	7, 087	967	977	42, 911	47, 281	59, 398	47, 828
March	39, 195	35, 768	23. 7	21. 8	293	302	104	45	4, 939	11, 606	1, 196	1, 604	44. 543	52, 085	58, 190	41, 860
April	34, 591	31, 426	22. 2	20. 1	282	286	114	97	5, 537	10, 417	871	1, 201	38, 175	42, 906	59, 668	39, 979
May	35, 553	32, 954	21. 8	19. 4	285	285	178	147	4, 966	9, 342	1, 314	1, 270	35, 760	41, 955	63, 576	39, 482
June	31, 155	32, 058	20. 4	18. 9	221	275	142	165	5, 385	9, 043	1, 037	1, 844	34, 814	39, 055	64, 628	40, 124
July	32, 043	35, 338	20. 1	19. 5	235	292	139	128	5, 813	8, 325	1, 191	1, 299	35, 583	40, 743	66, 084	42, 165
August	33, 183	35, 585	20. 4	19. 1	250	332	202	193	5, 985	9, 105	811	1, 639	38, 050	44, 762	66, 843	40, 979
September	33, 231	35, 343	20. 4	19. 4	215	310	63	130	7, 185	9, 061	745	1, 189	39, 675	42, 668	67, 117	41, 966
October	35, 361	38, 759	20. 9	20. 3	239	370	98	155	8, 181	10, 632	1, 193	898	41, 130	45, 980	68, 673	45, 004
November	35, 411	37, 202	21. 8	20. 3	209	327	84	116	7, 597	11, 778	1, 046	1, 402	45, 816	47, 977	65, 112	45, 048
December	37, 283	40, 475	21. 7	20. 7	239	345	89	117	10, 160	12, 689	1, 223	1, 726	51, 467	56, 198	60, 193	40, 750
Total	424, 909	425, 217	21. 7	20. 2	3, 033	3, 649	1, 717	1, 676	75, 175	119, 186	12, 641	16, 227	496, 021	552, 944	60, 193	40, 750
By districts:																
East Coast	68, 712	76, 094	23. 6	22. 5					(3)	(3)	(3)	(3)	(3)	(3)	10, 777	9, 912
Appalachian	8, 686	9, 456	15. 3	15. 6											456	499
Indiana, Illinois, Kentucky, etc	53, 421	57, 674	16. 1	15. 3	594	713									3, 625	3, 619
Oklahoma, Kansas, etc	23, 236	21, 824	14. 8	12. 2	258	586									1, 314	1, 102
Texas Inland	17, 167	14, 810	21. 2	18. 9	648	554									856	795
Texas Gulf Coast	86, 243	86, 589	18. 8	18. 2	250	256									6, 249	5, 080
Louisiana Gulf Coast	19, 934	21, 053	12. 5	12. 1	728	708									2, 139	2, 186
Arkansas, Louisiana Inland, etc	5, 815	4, 064	20. 8	15. 0	352	389									228	140
Rocky Mountain	14, 018	15, 063	22. 1	21. 0	203	443									558	810
California	127, 677	118, 590	39. 1	37. 0			1, 717	1, 676							33, 991	16, 607
Total	424, 909	425, 217	21. 7	20. 2	3, 033	3, 649	1, 717	1, 676	75, 175	119, 186	12, 641	16, 227	496, 021	552, 944	60, 193	40, 750

[1] Represents crude oil used as fuel on leases and for general industrial purposes.
[2] Preliminary figures.
[3] Figures not available.

TABLE 75.—Sales of residual fuel oil[1] in the United States, 1946–50, by uses[2]

[Thousands of barrels]

Use	1946	1947	1948	1949	1950
Railroads	100,305	97,500	89,588	63,467	60,878
Vessels (including tankers)	88,185	101,900	95,763	89,362	92,947
Gas and electric power plants	50,921	60,964	56,812	80,092	93,062
Smelters, mines, and manufacturing industries	99,011	115,108	117,780	122,633	148,111
Heating oils	49,734	56,402	58,639	60,414	72,716
U. S. Army, Navy, Air Force, and Coast Guard	35,822	19,147	24,655	22,724	28,333
Oil company fuel	58,054	62,649	56,637	[2] 51,667	53,263
Miscellaneous uses	5,028	6,859	6,623	4,574	4,898
Total United States	487,060	520,529	506,497	[2] 494,933	554,208
Exports and shipments to U. S. Territories and possessions	9,188	10,623	13,011	12,641	16,228
Total	496,248	531,152	519,508	[2] 507,574	570,436

[1] Includes Navy grade and crude oil burned as fuel.
[2] Revised.

industries bought greatly increased quantities of liquid fuel in 1950 compared with 1949. The gain in sales of residual fuel oil to gas and electric power plants in 1950 was 16 percent over 1949, while deliveries to smelters, mines, and manufacturing plants were greater by 21 percent. With a colder season and a 7-percent increase in commercial burner installations, 20 percent more heavy fuel oil was sold for heating buildings in 1950 than in 1949. Greater military activities due to the country's quickly expanding preparedness program and hostilities in Korea caused purchases of heavy grades of fuel oil by the armed forces to increase by a quarter. The oil companies, in producing and refining more crude petroleum in 1950 and in drilling a greater number of wells, consumed 3 percent more heavy fuel oil in 1950 than in 1949. Residual fuel oil sold for various miscellaneous uses was up by 7 percent in 1950 compared with 1949.

Sales of residual fuel oils in recent years are shown graphically in figure 11. All grades of heavy fuel oil and crude petroleum and acid sludge used as fuel are included.

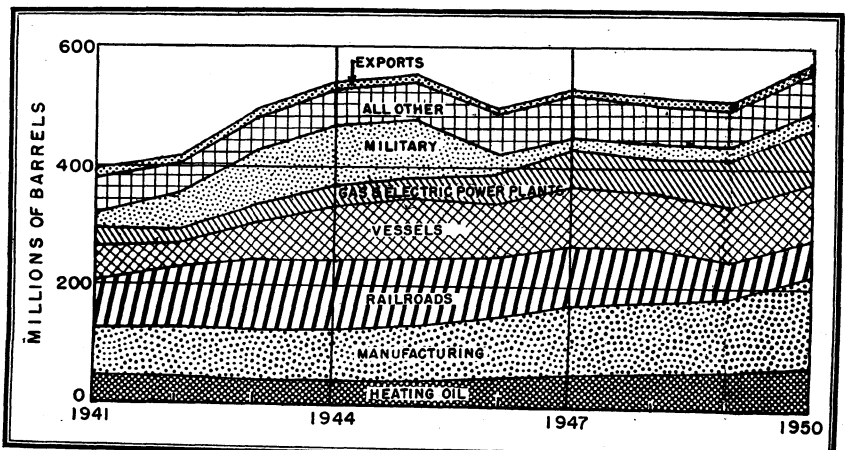

FIGURE 11.—Sales of residual fuel oil in the United States, 1941–50, by uses.

TABLE 76.—Sales of residual fuel oil[1] in the United States, 1946–50, by States

[Thousands of barrels]

District [2] and State	1946	1947	1948	1949	1950
District 1:					
Connecticut	7, 117	8, 838	10, 066	14, 515	16, 845
Delaware	1, 044	1, 139	1, 043	1, 921	2, 373
District of Columbia	1, 073	935	855	1, 427	1, 188
Florida	14, 085	15, 519	16, 132	15, 671	17, 009
Georgia	3, 018	2, 933	3, 375	4, 227	4, 733
Maine	2, 258	2, 809	2, 342	2, 704	3, 550
Maryland	14, 604	17, 119	13, 276	13, 521	14, 168
Massachusetts	14, 711	16, 976	18, 082	23, 476	30, 715
New Hampshire	768	959	909	1, 175	1, 873
New Jersey	42, 814	46, 167	33, 680	37, 973	49, 092
New York	30, 380	32, 907	45, 871	49, 168	61, 829
North Carolina	643	433	461	560	990
Pennsylvania	35, 097	35, 794	37, 240	35, 391	41, 110
Rhode Island	5, 576	7, 088	7, 917	8, 508	10, 891
South Carolina	2, 112	2, 349	2, 496	2, 610	3, 652
Vermont	203	262	258	281	382
Virginia	6, 402	11, 298	10, 590	12, 200	12, 883
West Virginia	482	828	1, 171	1, 366	1, 587
Total	182, 387	204, 353	205, 764	226, 694	274, 870
District 2:					
Illinois	15, 130	17, 047	15, 276	15, 570	19, 517
Indiana	11, 825	12, 386	13, 497	13, 343	15, 841
Iowa	1, 029	777	742	1, 176	1, 321
Kansas	9, 948	11, 224	10, 166	8, 226	5, 893
Kentucky	1, 005	824	1, 303	1, 679	1, 260
Michigan	5, 760	7, 046	11, 051	11, 403	12, 708
Minnesota	1, 089	1, 022	1, 315	1, 467	2, 432
Missouri	5, 164	6, 920	6, 609	5, 260	5, 389
Nebraska	491	378	329	422	550
North Dakota	572	414	447	358	297
Ohio	13, 651	16, 534	16, 069	16, 779	18, 004
Oklahoma	8, 157	8, 276	7, 723	5, 438	4, 783
South Dakota	306	257	288	262	294
Tennessee	813	1, 015	890	919	1, 398
Wisconsin	1, 610	1, 358	1, 497	1, 515	1, 712
Total	76, 550	85, 478	87, 222	83, 817	91, 399
District 3:					
Alabama	3, 180	3, 294	2, 296	1, 891	2, 271
Arkansas	2, 331	2, 253	2, 080	1, 833	2, 273
Louisiana	13, 052	14, 835	19, 434	15, 220	11, 221
Mississippi	294	343	411	314	348
New Mexico	1, 112	840	685	460	696
Texas	66, 466	66, 789	63, 376	48, 481	48, 560
Total	86, 435	88, 354	88, 282	68, 199	65, 369
District 4:					
Colorado	1, 237	1, 218	886	783	1, 050
Idaho	490	460	456	480	629
Montana	6, 274	5, 444	4, 935	3, 702	4, 222
Utah	1, 324	1, 486	1, 585	3, 639	4, 767
Wyoming	4, 365	3, 741	3, 877	2, 959	3, 024
Total	13, 690	12, 349	11, 739	11, 563	13, 692
District 5:					
Arizona	2, 618	3, 491	1, 841	1, 087	1, 448
California	92, 039	90, 916	79, 081	77, 171	78, 397
Nevada	5, 823	5, 957	4, 372	1, 514	2, 889
Oregon	14, 662	15, 482	14, 892	12, 845	12, 429
Washington	12, 856	14, 149	13, 304	12, 043	13, 715
Total	127, 998	129, 995	113, 490	104, 660	108, 878
Total United States	487, 060	520, 529	506, 497	[3] 494, 933	554, 208

[1] Includes some crude oil burned as fuel.
[2] States are grouped according to petroleum-marketing districts rather than to conventional geographic regions.
[3] Revised.

Exports (including shipments to the Territories) of 12,641,000 barrels of residual fuel oil in 1949 were slightly below the 1948 total; however there was an upturn to 16,227,000 barrels—a 28-percent gain—in 1950, according to published records of the Bureau of the Census, United States Department of Commerce. The countries that received the more important quantities in 1950 were as follows: Canada, 4,498,000 barrels; Mexico, 2,171,000; Cuba, 980,000; Canal Zone, 793,000; and Guatemala, 573,000.

Although crude runs to stills in 1950 were 8 percent above the 1949 total, production of residual fuel oil—425,217,000 barrels—differed little from the 1949 output of 424,909,000 barrels, as the percentage yield for these heavy grades of fuel oil was down from 21.7 percent in 1949 to 20.2 percent in 1950. All important refinery areas gained in output except the California district, which is credited with about 30 percent of the national total; there the production for 1950 was 7 percent below the comparative item for 1949. Quantities credited to the Texas Gulf Coast area, source of about a fifth of the production, were virtually the same for both 1949 and 1950, while petroleum refineries in the east coast area stepped up their output 11 percent in 1950. Still another important source of residual fuel oil, the Indiana-Illinois-Kentucky refinery district, reported an 8-percent gain in production in 1950 over the previous year. In the remaining refinery districts the 1950 production of heavy fuel oil exceeded the 1949 total for the Appalachian, Louisiana Gulf, and Rocky Mountain areas and was lower in the Oklahoma-Kansas, Texas Inland, and Arkansas-Louisiana Inland refinery areas.

Some heavy crude petroleum is burned as fuel on oil-company leases and at some industrial plants. These quantities are added to the available fuel oil as "transfers" and represent about 1 percent of the total supply from all sources. These transfers rose from 4,750,000 barrels in 1949 to 5,325,000 in 1950— a gain of 12 percent. Quantities reported for refinery districts east of California were 3,033,000 barrels in 1949 and 3,649,000 in 1950, while the total for the California area declined from 1,717,000 barrels in 1949 to 1,676,000 in 1950.

Residual fuel oil imported from foreign countries rose sharply from 75,175,000 barrels in 1949 to 119,186,000 in 1950—a gain of 59 percent. This imported heavy fuel oil represented about 21 percent of the available supply in 1950 compared with a 15-percent proportion in 1949. Most of the residual fuel imported in 1950 came from the Netherlands Antilles (96,666,000 barrels) and Venezuela (22,191,000 barrels). Trinidad and Tobago and Mexico also supplied comparatively small quantities.

The 40,750,000 barrels of residual fuel oil held in storage at the end of 1950 was a third below the comparative total for 1949 (60,193,000 barrels). This heavy draft on stocks in 1950 was necessary, as production of these heavy grades in 1950 remained at the 1949 rate, while both export and domestic demand was up considerably. Normally over half (about 57 percent in 1949) of the residual-fuel stocks is held in the California marketing area; however, there was a big shrinkage (51 percent) there in 1950 to a 41-percent share of the national total, partly because the west coast made unusually heavy shipments of heavy fuel oil to the eastern seaboard in 1950. Fairly important amounts of residual fuel oils are also stored in the East Coast and Texas Gulf Coast refinery districts, and these quantities were also reduced considerably (8 and 19 percent, respectively). The only areas to gain in inventory in 1950 over 1949 were the Appalachian, Louisiana Gulf Coast, and the Rocky Mountain districts; however, the quantities involved are relatively unimportant.

Heavy grades of fuel oil stored at petroleum refineries declined by 38 percent from 49,668,000 barrels at the close of 1949 to 31,003,000 at the end of 1950. The 1949 quantity represented about 83 percent of all heavy fuel-oil stocks and the 1950 quantity about 76 percent. Bulk terminals reported 10,525,000 barrels of residual grades at the end of 1949 and 9,747,000 at the end of 1950, a shrinkage of 7 percent in volume.

Quantities of residual fuel oil in storage at the end of 1949 represented a 36-day domestic supply at the January 1950 rate of demand; this was down to a 23-day supply at the January 1951 rate by the end of December 1950.

Oil companies operating in the Pacific Coast marketing area shipped 362,000 barrels of residual fuel oil by rail and truck to other Western States in 1950 compared with a total of 104,000 in 1949 and received in return over overland routes 370,000 barrels of heavy fuel oils in 1950 compared with 543,000 in 1949.

Tanker shipments of residual fuel from California to the east coast "skyrocketed" from 97,000 barrels in 1948 to 6,419,000 in 1949 and to 15,429,000 barrels in 1950. This accelerated movement of heavy fuel from the west to the east coast began in the third quarter of 1949 and reached a peak of 7,895,000 barrels in the first 3 months of 1950; it then dwindled to only 140,000 barrels in the closing quarter of that year and to 79,000 in the initial quarter of 1951. This eastward tanker movement of heavy fuel oil was an effort to get rid of excessive stocks in California and to take advantage of an 80-cent price differential prevailing at New York while the movement was at its greatest height.

There has been a slight downward trend in tanker and barge shipments of residual fuel oil from the Gulf coast to the east coast in recent years—from 68,662,000 barrels in 1948 to 67,425,000 in 1949 and down to 59,292,000 in 1950, according to information compiled by the Oil and Gas Division, United States Department of the Interior. Shipments from Texas fluctuated from 55,325,000 barrels in 1948 to 56,996,000 in 1949 and then down to 53,102,000 in 1950, while quantities originating in Louisiana were 12,907,000 barrels in 1948, 10,429,000 in 1949, and 6,190,000 in 1950, and in Alabama 430,000 barrels in 1948 only.

The barging of heavy fuel up the Mississippi River and its tributaries from the Gulf coast, Arkansas, and Mississippi increased noticeably from 1,057,000 barrels in 1948 and 1,111,000 in 1949 to 5,465,000 barrels in 1950. Quantities originating in Texas have varied from 105,000 barrels in 1948 to 46,000 in 1949 and 980,000 in 1950; from Louisiana, 896,000 barrels in 1948 to 972,000 in 1949 and 4,464,000 in 1950; and from Arkansas and Mississippi, 56,000 barrels in 1948, to 93,000 in 1949 and 21,000 in 1950. Residual fuel oil transported by river barges was terminated as follows: District 1, 224,000 barrels in 1948, 117,000 in 1949, and 2,717,000 in 1950; district 2, 659,000 barrels in 1948, 865,000 in 1949 and 2,740,000 in 1950; and district 3, 174,000 barrels in 1948, 129,000 in 1949, and 8,000 in 1950.

The tanker rate for Bunker "C" fuel oil on the Gulf coast–New York run was 37.2 cents a barrel for vessels of over 14,000 tons deadweight at the end of December 1949, according to Platt's Oil Price Handbook for 1950. There were numerous new postings for this freight rate throughout 1950, ranging from a low of 23.1 cents a barrel on February 15 to a high of $1.052 a barrel on December 28. The average rate for all of 1950 was 41.1 cents a barrel compared with 28 cents for 1949.

The general level of the average prices of representative grades of residual fuel oils was higher in 1950 than in 1949. The price of No. 6 fuel oil at refineries in Oklahoma, which was selling at an average monthly price of $1.34 a barrel in January 1950, increased gradually during the year to $1.79 a barrel for December 1950. The average price for this grade was $1.64 a barrel for all of 1950 compared with $1.08 in 1949. No. 5 Grade at New York Harbor averaged $2.75 a barrel during January 1950 and then fluctuated downward during the spring and summer, reaching a low of $2.55 a barrel during March, after which it gradually increased to $3.10 for November and December 1950. The average quotation for this grade for 1950 was $2.79 a barrel compared with $2.69 a barrel for 1949. The price of Bunker "C" to vessels bunkering in New York Harbor followed a pattern similar to No. 5, starting at $2.05 a barrel in January 1950, reaching its low point of $1.91 also in March, and increasing gradually to the high of the year of $2.22 for October. The average price of this grade for 1950 was $2.09 a barrel compared with $1.90 for 1949. Bunker "C" at New Orleans fluctuated from $1.75 a barrel for January and February 1950 to a low for the year of $1.60 a barrel in March, after which it gradually increased to a high of $1.85, which price prevailed from August through December 1950. The average quotation of this grade for 1950 was $1.78 a barrel compared with $1.57 for 1949. The San Pedro price for Bunker "C" remained constant at $1.25 a barrel from January through May 1950 and fluctuated upward to a high for the year of $1.71 a barrel in December 1950. The average price for this grade was lower during 1950 than in 1949, averaging $1.41 as against $1.64.

Retail prices of heavy fuel oils also were generally higher in 1950 than in 1949, according to records published monthly by the Bureau of Labor Statistics, United States Department of Labor. The average price of No. 6 Grade in New York in 1950 was 5.93 cents a gallon compared with 5.59 cents in 1949. The price of this grade was 5.91 cents a gallon in January 1950, after which it declined to a low of 5.61 cents in March and then gradually increased to a high for the year of 6.14 cents during the final quarter of 1950. The average price of No. 5 heavy fuel oil at Chicago was 9.27 cents a gallon during 1950 compared with 8.66 cents during 1949. The quotation for this grade was 8.62 cents a gallon during January 1950, after which it gradually increased to 9.69 cents, where it held during the September-November period, then reached its high point of the year at 9.84 cents in December 1950.

TABLE 77.—Monthly average prices of residual fuel oil in the United States, 1949–50

[Platt's Oil Price Handbook]

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1949													
No. 6 fuel oil at refineries, Oklahoma....dollars per barrel	1.70	1.49	1.43	1.19	1.10	0.92	0.90	0.97	0.82	0.92	0.90	1.03	1.08
No. 5 fuel oil at New York Harbor....do....	3.17	3.08	2.82	2.56	2.46	2.38	2.38	2.45	2.70	2.78	2.79	2.74	2.69
Bunker "C" for ships:													
New York....do....	2.42	2.09	1.95	1.83	1.70	1.60	1.60	1.69	1.82	1.96	2.05	2.05	1.90
New Orleans....do....	2.01	1.61	1.53	1.44	1.36	1.32	1.37	1.45	1.54	1.68	1.75	1.75	1.57
San Pedro....do....	2.17	2.00	1.98	1.85	1.85	1.60	1.60	1.60	1.30	1.25	1.25	1.25	1.64
1950													
No. 6 fuel oil at refineries, Oklahoma....dollars per barrel..	1.34	1.52	1.57	1.60	1.67	1.69	1.68	1.68	1.70	1.70	1.70	1.79	1.64
No. 5 fuel oil at New York Harbor....do....	2.75	2.69	2.55	2.59	2.63	2.63	2.71	2.80	2.94	3.03	3.10	3.10	2.79
Bunker "C" for ships:													
New York....do....	2.05	2.05	1.91	2.00	2.05	2.05	2.14	2.15	2.20	2.22	2.16	2.15	2.09
New Orleans....do....	1.75	1.75	1.60	1.70	1.75	1.75	1.84	1.85	1.85	1.85	1.85	1.85	1.78
San Pedro....do....	1.25	1.25	1.25	1.25	1.25	1.26	1.46	1.55	1.55	1.55	1.55	1.71	1.41

LUBRICANTS

The refinery production of lubricants increased from 45.4 million barrels in 1949 to 51.7 million in 1950—a gain of 14.0 percent that brought output back to a little above that in 1948. The increase of 6.3 million barrels in production in 1950 included gains of 2.3 million barrels in the Louisiana Gulf district, 1.6 million in the East Coast, 1.5 million in the Texas Gulf, and 0.5 million in the Indiana-Illinois and Inland Louisiana-Arkansas. The only declines were 0.6 million barrels in the California district and 0.1 million in the Texas Inland district. Production in the Texas Gulf district represented 32.1 percent of the total compared with 19.7 percent in the East Coast district, 10.4 percent in the Appalachian district, 9.3 percent in the Indiana-Illinois district, 8.7 percent in the Louisiana Gulf district, 8.1 percent in the Oklahoma-Kansas district, 8.0 percent in the California district, and 3.7 percent in other districts. Production in 1949 was supplemented by a decline of 0.6 million barrels in stocks and in 1950 by a decline of 1.4 million in stocks.

TABLE 78.—Salient statistics of lubricants in the United States, 1949–50, by months and districts

Month and district	Production (thousand barrels)		Yield (percent)		Domestic demand (thousand barrels)		Stocks, end of period (thousand barrels)	
	1949	1950 [1]	1949	1950 [1]	1949	1950 [1]	1949	1950 [1]
By months:								
January	4,193	3,932	2.4	2.3	2,597	2,846	10,326	9,323
February	3,638	3,587	2.4	2.4	2,196	2,368	10,856	9,341
March	3,698	4,086	2.2	2.5	2,426	3,271	10,931	8,989
April	3,457	3,645	2.2	2.3	2,713	2,544	10,588	8,787
May	3,606	4,039	2.2	2.4	2,752	3,346	10,089	8,280
June	3,804	4,002	2.5	2.4	3,023	3,588	9,922	7,736
July	3,554	4,151	2.2	2.3	2,699	3,339	9,731	7,427
August	3,510	4,686	2.1	2.5	3,111	3,822	8,962	7,145
September	3,729	4,646	2.3	2.6	3,026	3,511	8,734	6,950
October	4,116	4,987	2.4	2.6	2,929	3,907	8,894	6,973
November	3,984	4,906	2.4	2.7	2,982	3,322	9,109	7,283
December	4,100	5,068	2.4	2.6	2,647	3,012	9,219	7,849
Total	45,389	51,735	2.3	2.5	33,101	38,876	9,219	7,849
By districts:								
East Coast	8,645	10,214	3.0	3.0	(2)	(2)	2,327	1,965
Appalachian	5,053	5,395	8.9	8.9			866	535
Indiana, Illinois, Kentucky, etc	4,291	4,800	1.3	1.3			1,089	915
Oklahoma, Kansas, etc	3,823	4,174	2.4	2.3			730	385
Texas Inland	198	74	.3	.1			44	23
Texas Gulf Coast	15,128	16,590	3.3	3.5			2,562	2,578
Louisiana Gulf Coast	2,242	4,520	1.4	2.6			423	599
Arkansas, Louisiana Inland, etc	1,105	1,600	3.9	5.9			154	68
Rocky Mountain	235	250	.4	.3			103	117
California	4,669	4,118	1.4	1.3			921	664
Total	45,389	51,735	2.3	2.5	33,101	38,876	9,219	7,849

[1] Preliminary figures.
[2] Figures not available.

The total demand for lubricants increased from 46.0 million barrels in 1949 to 53.1 million in 1950—a gain of 7.1 million barrels or over 15 percent. Exports increased from 12.9 million barrels to 14.2 million, while domestic demand rose from 33.1 million to 38.9 million or over 17 percent.

The sharp gain in domestic demand can be attributed to greater industrial activity and increased automotive use. No current figures are available on the relative demand for industrial and automotive use. The growth in automotive requirements has been affected by the reclamation of lubricants for reuse and the improved quality that has cut down the frequency of change required.

Table 79 shows the prices of representative lubricating oils for 1949 and 1950.

TABLE 79.—Average monthly refinery prices of five selected grades of lubricating oil in the United States, 1949–50, in cents per gallon

[National Petroleum News]

Year and grade	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1949													
Oklahoma:													
200 viscosity, No. 3 color, neutral	16.50	15.03	14.50	14.14	13.00	13.00	12.76	12.75	12.75	12.50	12.50	12.50	13.39
150–160 viscosity at 210°, bright stock, 10–25 pour test	26.39	23.55	20.90	19.42	18.70	17.75	17.75	17.75	17.75	17.75	17.75	17.75	19.43
Pennsylvania:													
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	25.00	24.00	23.54	21.31	17.00	17.00	17.00	17.00	17.14	17.50	17.50	17.50	19.29
600 steam-refined, cylinder stock, filterable	27.86	23.20	18.54	16.10	14.21	12.07	12.25	12.10	11.75	11.75	11.75	11.75	15.28
Gulf Coast: 500 viscosity, No. 2½–3½ color, neutral	14.75	14.75	14.51	13.36	13.00	13.00	12.98	12.24	12.00	12.00	12.00	12.00	13.05
1950													
Oklahoma:													
200 viscosity, No. 3 color, neutral	12.45	12.00	12.00	12.00	12.05	12.50	13.13	14.57	16.35	17.48	17.50	17.90	14.16
150–160 viscosity at 210°, bright stock, 10–25 pour test	17.65	16.75	16.75	16.75	17.09	18.20	19.88	22.29	26.00	27.23	27.25	28.70	21.21
Pennsylvania:													
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	17.50	17.50	17.50	17.31	17.90	18.74	21.73	25.00	26.05	27.00	27.00	28.45	21.81
600 steam-refined, cylinder stock, filterable	11.75	11.75	11.75	11.75	12.00	13.06	15.16	18.48	20.63	22.00	22.05	24.23	16.22
Gulf Coast: 500 viscosity, No. 2½–3½ color, neutral	12.00	12.00	12.00	12.00	12.00	12.73	13.28	14.00	14.00	14.00	14.31	14.85	13.10

232294—53——63

LIQUEFIED GASES

The demand for liquefied gases for fuel and chemical uses has expanded rapidly in the last few years and now ranks after kerosine in volume.

The supply of liquefied gases includes both that part of the output of natural-gasoline and cycle plants sold for fuel and chemical uses and the output of liquefied refinery gases sold for the same uses. Similar materials used for blending with motor fuel are accounted for as part of the output of that product. Direct use of natural-gas liquids increased from 46.0 million barrels in 1949 to 57.8 million barrels in 1950, while liquefied-refinery-gas production rose from 23.5 million to 29.1 million barrels.

The total demand for liquefied gases increased from 66.6 million barrels in 1948 to 69.5 million in 1949 and 86.7 million in 1950. Exports increased from 1.1 million in 1948 to 1.3 million in 1949 and 1.6 million in 1950. Domestic demand rose from 65.5 million in 1948 to 68.2 million in 1949 and 85.1 million in 1950. The relative gain over the preceding year was about 24 percent in 1948, 4 percent in 1949, and 25 percent in 1950. Details on the sales of liquefied gases by types and uses may be found in the Natural Gasoline chapter of this volume.

OTHER PRODUCTS

Wax.—The refinery production of wax increased from 3,208,000 barrels in 1949 to 4,462,000 in 1950, converted from pounds at the rate of 280 to the barrel. The total increase in production amounted to 1,254,000 barrels, with increases in all districts, except for a decline of 42,000 barrels in the Appalachian district. The principal gains were 404,000 barrels in the Louisiana Gulf district, 377,000 barrels in the East Coast district, 240,000 barrels in the Texas Gulf district, 119,000 in California, and 96,000 barrels in the Oklahoma-Kansas district. Production in the East Coast district represented 38.2 percent of the total in 1948, 34.3 percent in 1949, and 33.1 percent in 1950.

Stocks declined 78,000 barrels in 1949 and increased 31,000 barrels in 1950. Total demand increased from 3,286,000 barrels in 1949 to 4,431,000 in 1950. Exports rose from 1,031,000 barrels to 1,195,000, while domestic demand increased from 2,255,000 barrels to 3,236,000. The average refinery price of white crude scale wax at Pennsylvania refineries declined from 4.85 cents per pound in 1949 to 4.24 cents in 1950.

TABLE 80.—Salient statistics of wax in the United States, 1949–50, by types, months, and districts

Thousands of barrels][1]

Month and district	Production						Domestic demand (all types)		Exports (all types)		Stocks, end of period					
	1949			1950[2]							1949			1950[2]		
	Microcrystaline	Fully refined	Other	Microcrystaline	Fully refined	Other	1949	1950[2]	1949	1950[2]	Microcrystaline	Fully refined	Other	Microcrystaline	Fully refined	Other
By months:																
January	16	159	102	17	172	125	191	196	95	113	55	130	357	48	174	256
February	22	134	64	32	237	93	154	236	113	87	64	140	291	60	262	195
March	11	170	93	20	176	89	183	240	98	70	60	140	288	51	219	222
April	13	156	78	31	211	123	169	271	85	86	71	134	276	78	197	225
May	13	147	99	28	181	165	145	258	93	74	64	142	296	53	229	260
June	16	148	97	32	166	155	164	240	68	89	53	152	326	55	225	286
July	10	146	73	35	162	147	165	248	65	85	51	166	313	61	206	310
August	18	161	59	38	182	187	206	329	63	113	55	151	293	59	169	314
September	11	176	73	36	219	155	235	296	77	135	54	129	264	54	155	312
October	20	201	135	47	204	132	258	309	80	112	51	137	277	63	161	259
November	21	168	68	46	236	147	186	306	86	121	39	146	265	69	161	255
December	18	192	120	43	211	182	199	307	108	110	51	174	248	74	157	273
Total	189	1,958	1,061	405	2,357	1,700	2,255	3,236	1,031	1,195	51	174	248	74	157	273
By districts:																
East Coast	80	731	284	142	821	515					14	42	99	15	37	111
Appalachian	18	151	225	28	141	183					14	25	31	16	14	26
Indiana, Illinois, Kentucky, etc	-------	215	33	1	251	31					1	16	55	-------	7	48
Oklahoma, Kansas, etc	59	77	174	96	39	271					15	-------	14	19	4	11
Texas Inland	-------	-------	4	-------	-------	6	(3)	(3)	(3)	(3)	-------	-------	-------	-------	-------	-------
Texas Gulf Coast	16	433	104	98	579	116					5	65	3	22	33	21
Louisiana Gulf Coast	−1	102	237	22	140	580					1	9	25	2	13	38
Rocky Mountain	11	64	-------	18	82	−2					1	7	21	-------	8	18
California	-------	185	-------	-------	304	-------					-------	10	-------	-------	41	-------
Total	189	1,958	1,061	405	2,357	1,700	2,255	3,236	1,031	1,195	51	174	248	74	157	273

[1] Conversion factor: 280 pounds to the barrel.
[2] Preliminary figures.
[3] Figures not available

TABLE 81.—Average monthly refinery price of 124°–126° white crude scale wax at Pennsylvania refineries, 1946–50, in cents per pound

[National Petroleum News]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1946	4.25	4.25	4.25	4.25	4.25	4.25	4.32	5.66	5.76	6.00	6.00	6.07	4.94
1947	6.19	7.06	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.85	7.88	8.03	7.61
1948	8.57	8.75	8.71	8.50	8.50	8.38	8.13	8.10	7.45	7.38	7.38	6.30	8.01
1949	5.38	5.23	5.28	5.25	4.97	4.95	4.92	4.90	4.18	3.98	4.60	4.63	4.85
1950	4.24	3.63	3.63	3.63	3.59	3.50	3.51	3.80	4.35	4.94	5.52	6.58	4.24

Coke.—The production of petroleum coke increased from 17.0 million barrels in 1949 to 17.2 million in 1950 (converted at the rate of 5 barrels to the short ton). The principal changes, by refinery districts, were increases of 0.7 million barrels in the East Coast district and 0.2 million in the Inland Louisiana-Arkansas district, and declines of 0.3 million in the Texas Inland district and 0.2 million each in the Texas Gulf and Indiana-Illinois districts. The Indiana-Illinois district is the largest producer, representing 49.6 percent of the total output in 1948, 47.6 percent in 1949, and 45.8 percent in 1950.

The total demand for petroleum coke rose from 16.9 million barrels in 1949 to 17.5 million in 1950. Exports were static at 2.5 million barrels, while domestic demand rose from 14.4 million to 15.0 million.

TABLE 82.—Salient statistics of petroleum coke in the United States, 1949–50, by months and districts [1]

Month and district	Production (thousand barrels)		Yield (percent)		Domestic demand (thousand barrels)		Stocks, end of period (thousand barrels)	
	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]	1949	1950 [2]
By months:								
January	1,439	1,454	0.8	0.8	1,075	1,310	771	745
February	1,263	1,295	.8	.8	1,015	1,200	790	774
March	1,378	1,271	.8	.8	1,097	1,405	870	560
April	1,303	1,230	.8	.8	979	1,021	990	584
May	1,614	1,482	1.0	.9	1,186	1,196	1,136	664
June	1,409	1,519	.9	.9	1,230	1,382	1,142	644
July	1,510	1,591	.9	.9	1,200	1,317	1,203	624
August	1,520	1,576	.9	.8	1,237	1,515	1,249	505
September	1,337	1,415	.8	.8	1,247	1,060	1,180	521
October	1,464	1,447	.9	.8	1,349	1,108	1,085	424
November	1,401	1,439	.9	.8	1,502	1,238	802	369
December	1,321	1,505	.8	.8	1,310	1,268	698	408
Total	16.959	17,224	.9	.8	14,427	15,020	698	408
By districts:								
East Coast	1,040	1,762	.4	.5			------	------
Appalachian	318	286	.6	.5			12	8
Indiana, Illinois, Kentucky, etc	8,067	7,891	2.4	2.1			174	169
Oklahoma, Kansas, etc	1,406	1,406	.9	.8			30	56
Texas Inland	607	322	.8	.4			23	7
Texas Gulf Coast	1.624	1,417	.4	.3	[3]	[3]	60	3
Louisiana Gulf Coast	1,444	1,538	.9	.9			1	------
Arkansas, Louisiana Inland, etc	------	165	------	.6			------	47
Rocky Mountain	526	638	.8	.9			63	15
California	1,927	1,799	.6	.6			335	103
Total	16,959	17,224	.9	.8	14.427	15,020	698	408

[1] Conversion factor: 5.0 barrels to the short ton.
[2] Preliminary figures.
[3] Figures not available.

Asphalt and Road Oil.—The total demand for petroleum asphalt rose from 50.9 million barrels in 1949 to 59.7 million in 1950—a gain of 8.8 million or about 17 percent (asphalt is converted at the rate of 5.5 barrels to the short ton). Exports declined from 1.6 million barrels in 1949 to 1.0 million in 1950, while domestic demand rose from 49.4 million barrels to 58.7 million. The domestic demand for road oil declined from 7.8 million barrels in 1949 to 6.9 million in 1950. Details on sales of asphalt and types of products will be found in the Asphalt chapter of this volume.

Still Gas.—The production of still gas increased from 82.6 million barrels equivalent in 1949 to 83.7 million in 1950. Expressed in cubic feet, the rise was from 297.4 billion in 1949 to 301.5 billion in 1950. The major use of still gas is for refinery fuel. The conversion to barrels is on the basis of crude-oil equivalent rather than heating value.

TABLE 83.—Production of still gas in the United States, 1948–50, by districts

District	1948		1949		1950 [1]	
	Million cubic feet	Equivalent, in thousand barrels	Million cubic feet	Equivalent, in thousand barrels	Million cubic feet	Equivalent, in thousand barrels
East Coast	34.168	9.491	36,637	10.177	40,428	11,230
Appalachian	10.879	3.022	12,110	3.364	12,730	3.536
Indiana, Illinois, Kentucky, etc	56,117	15.588	64,127	17,813	67.651	18,792
Oklahoma, Kansas, etc	23,360	6,489	20,693	5.748	22,255	6.182
Texas Inland	14,526	4.035	13,533	3.759	10,706	2,974
Texas Gulf Coast	82,087	22,802	80.640	22,400	73,887	20.524
Louisiana Gulf Coast	20.642	5.734	18,756	5,210	19.490	5,414
Arkansas, Louisiana Inland, etc	5.198	1,444	3.733	1,037	2,668	741
Rocky Mountain	8,039	2.233	7,243	2,012	8.964	2,490
California	37,156	10,321	39,964	11,101	42,696	11,860
Total	292,172	81,159	297,436	82,621	301,475	83,743

[1] Preliminary figures.

Miscellaneous Finished Products.—The production of miscellaneous finished products at refineries in the United States amounted to 4,236,000 barrels in 1949 and 4,717,000 barrels in 1950. The character of these products is indicated in table 84.

TABLE 84.—Production of miscellaneous finished oils in the United States in 1950, by districts and classes

[Thousands of barrels]

District	Petrolatum	Absorption oil	Medicinal oil	Specialties	Solvents	Other	Total
East Coast	28	11	26	281	55	-------	401
Appalachian	198	29	-------	9	30	-------	266
Indiana, Illinois, Kentucky, etc	62	-------	-------	726	-------	55	843
Oklahoma, Kansas, etc	381	153	-------	17	44	14	609
Texas Inland	-------	326	-------	25	-------	2	353
Texas Gulf Coast	197	209	-------	91	40	84	621
Louisiana Gulf Coast	-------	8	-------	-------	-------	2	10
Arkansas, Louisiana Inland, etc	-------	309	7	-------	-------	-------	316
Rocky Mountain	-------	8	-------	-------	-------	3	11
California	-------	18	31	760	99	379	1,287
Total	866	1,071	64	1,909	268	539	4,717

INTERCOASTAL SHIPMENTS

Total shipments of mineral oils, crude and refined, from Gulf coast ports to east coast ports amounted to 566.0 million barrels in 1948, declined to 514.9 million in 1949, and rose to 559.6 million in 1950. The growth of this movement has been affected by the relatively larger increase in imports of crude and products and by a material gain in product receipts from California. The shipments of crude amounted to 196.8 million barrels in 1948, declined to 143.0 million in 1949, and rose to 163.7 million in 1950. Shipments of gasoline gained steadily from 145.8 million barrels in 1948 to 155.6 million in 1949 and 166.7 million in 1950. Shipments of residual fuel oil, subject to the greatest competition from foreign sources and California, declined from 68.7 million barrels in 1948 to 67.4 million in 1949 and 59.3 million in 1950.

The total movement of surplus products from California to the east coast rose from 2.1 million barrels in 1948 to 7.6 million in 1949 and 23.5 million in 1950. The principal changes in 1950, compared with 1949, were the increase for residual fuel from 6.4 million barrels to 15.4 million and the gain in gasoline shipments from 0.7 million barrels to 5.9 million. Almost two thirds of the total movement occurred in the first half of 1950, the subsequent expansion in military requirements tending to limit the flow.

TABLE 85.—Mineral oils, crude and refined, shipped commercially from Gulf coast to east coast ports of the United States, 1949–50, by classes [1]

[Thousands of barrels]

Year and class	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Crude petroleum	13, 648	12, 250	13, 149	12, 479	12, 319	8, 382	11, 704	11, 437	12, 071	12, 300	10, 353	12, 931	143, 023
Gasoline	11, 585	10, 849	12, 334	13, 143	14, 320	14, 170	13, 486	12, 127	13, 462	13, 896	13, 752	12, 466	155, 590
Kerosine	3, 917	2, 772	2, 816	2, 644	2, 434	1, 546	3, 311	2, 056	2, 448	3, 324	3, 228	4, 549	35, 045
Distillate fuel oil	11, 921	10, 508	8, 355	7, 879	6, 829	5, 395	5, 874	8, 157	7, 355	8, 201	9, 591	12, 082	102, 147
Residual fuel oil	6, 677	6, 322	6, 281	4, 941	5, 704	4, 564	5, 257	5, 195	4, 945	4, 914	6, 389	6, 236	67, 425
Lubricating oils	868	428	524	476	744	826	555	620	581	592	560	514	7, 288
Miscellaneous oils	400	224	222	385	284	548	265	294	421	361	413	526	4, 343
Total	49, 016	43, 353	43, 681	41, 947	42, 634	35, 431	40, 452	39, 886	41, 283	43, 588	44, 286	49, 304	514, 861
1950													
Crude petroleum	12, 784	8, 789	11, 277	13, 779	15, 257	13, 684	16, 062	14, 012	14, 630	15, 413	14, 387	13, 669	163, 743
Gasoline	13, 637	10, 755	11, 591	13, 842	14, 634	13, 576	14, 548	14, 659	14, 696	15, 758	14, 668	14, 332	166, 696
Kerosine	4, 489	3, 203	3, 013	3, 228	2, 055	2, 705	2, 968	4, 077	3, 246	3, 571	4, 018	5, 173	41, 746
Distillate fuel oil	13, 906	9, 147	11, 055	8, 131	7, 972	6, 876	6, 894	8, 246	9, 082	9, 905	10, 407	13, 707	115, 328
Residual fuel oil	5, 716	4, 476	5, 743	4, 275	3, 847	3, 910	4, 424	4, 215	4, 560	5, 901	5, 260	6, 965	59, 292
Lubricating oils	515	533	458	494	697	548	450	462	657	565	665	773	6, 817
Miscellaneous oils	401	528	534	110	468	664	539	722	407	508	491	606	5, 978
Total	51, 448	37, 431	43, 671	43, 859	44, 930	41, 963	45, 885	46, 393	47, 278	51, 621	49, 896	55, 225	559, 600

[1] Oil and Gas Division, U. S. Department of the Interior.

FOREIGN TRADE [6]

> Foreign trade statistics in this section are as reported by the United States Department of Commerce and may differ slightly from those in other sections of this chapter. Bureau of Mines petroleum import data pertain to continental United States only, while its export statistics include not only foreign countries, but also shipments to the Territories. Crude-petroleum imports shown elsewhere are obtained by the Bureau of Mines from petroleum companies in order to balance refinery reports and do not provide a country of origin and country of destination breakdown, as do Department of Commerce statistics.

Imports.—Total imports of crude petroleum and petroleum products into continental United States increased 28.5 percent from 1949 to 1950. In 1949 total imports of mineral oils exceeded total exports (including shipments to the Territories) by 108 percent, and in 1950 imports exceeded exports by 188 percent. Imported mineral oils constituted 12.6 percent of the total new supply in continental United States in 1950, compared with 10.5 percent in 1949.

Crude-petroleum imports represented 65 percent of the total imports in 1949 and 57 percent in 1950. Venezuela supplied 66 percent of the crude petroleum imported into the United States in 1949 and 62 percent in 1950. Colombia and Mexico both increased their shipments of crude petroleum to the United States in 1950. Middle East countries furnished 24 percent in 1949 and 23 percent in 1950.

Residual-fuel-oil imports into continental United States and the Territories increased from 32 percent of the total imports in 1949 to 40 percent in 1950. The Netherlands Antilles, which shipped 93 percent of the residual fuel oil imported into continental United States and the Territories in 1949, supplied 79 percent in 1950, while Venezuela, where refining capacity was tripled during 1950, increased its share from 5 percent in 1949 to 18 percent in 1950.

Caribbean countries and Mexico, the principal suppliers of the comparatively small quantities of distillate fuel oil imported into continental United States and the Territories in 1948 and 1949, supplied only 48 percent of such imports in 1950. Middle Eastern countries increased their share from 28 percent in 1949 to 52 percent in 1950.

Imports of unfinished oil increased 70 percent from 1949 to 1950, with Mexico the principal supplier in both years.

[6] By F. X. Jordan, Petroleum and Natural Gas Branch, Bureau of Mines.

TABLE 86.—Crude petroleum and major petroleum products imported for consumption into the United States, 1949–50, by countries, in thousands of barrels [1]

[U. S. Department of Commerce]

Country	Crude petroleum	Motor fuel [2]	Kerosine	Distillate oil [3]	Residual oil [4]	Unfinished oil	Total
1949							
North America:							
Canada	(5)	71	(5)	4	458	75	608
Mexico	4,250				333	4,262	8,845
Netherlands Antilles		1		926	[6] 72,063	2	[6] 72,992
Trinidad and Tobago	89	[6] 22		472	718		[6] 1,301
Total	4,339	[6] 94	(5)	1,402	[6] 73,572	4,339	[6] 83,746
South America:							
Colombia	11,425			76	114		11,615
Venezuela	[6] 101,720			225	[6] 3,913	71	[6] 105,929
Total	[6] 113,145			301	[6] 4,027	71	[6] 117,544
Europe: United Kingdom	(7)	(5)			[6] 2		2
Asia:							
India					5		5
Indonesia	(5)						(5)
Iran	1,356			(5)			1,356
Iraq	344						344
Kuwait	23,075			2			23,077
Saudi Arabia	12,460			352	4		12,816
State of Bahrein				308			308
Total	37,235			662	9		37,906
Africa: Spanish					2		2
Grand total	[6] 154,719	[6] 94	(5)	2,365	[6] 77,612	4,410	[6] 239,200
Imports into United States Territories and possessions from foreign countries:							
Hawaii				541			541
PuertoRico		19			2,282	2	2,303
Total		19		541	2,282	2	2,844
Total net imports into continental United States	[6] 154,719	75	(5)	1,824	75,330	4,408	[6] 236,356
1950							
North America:							
Canada	5	57	(5)	1	1	12	76
Mexico	9,493	(5)		(5)	1,025	6,699	17,217
Netherlands Antilles		196	270	1,068	96,666	7	98,207
Trinidad and Tobago	216	5		(5)	2,019	763	3,003
Total	9,714	258	270	1,069	99,711	7,481	118,503
South America:							
Chile						(5)	(5)
Colombia	15,699				4		15,703
Venezuela	106,948			278	22,191	31	129,448
Total	122,647			278	22,195	31	145,151
Europe:							
Belgium-Luxembourg		8					8
Czechoslovakia		23					23
Germany	(5)	11					11
Netherlands						(5)	(5)
Poland-Danzig		114					114
United Kingdom		368		(5)		(5)	368
Total	(5)	524		(5)		(5)	524

For footnotes, see end of table.

TABLE 86.—Crude petroleum and major petroleum products imported for consumption into the United States, 1949–50, by countries, in thousands of barrels [1]—Continued

[U. S. Department of Commerce]

Country	Crude petroleum	Motor fuel [2]	Kerosine	Distillate oil [3]	Residual oil [4]	Unfinished oil	Total
1950—Continued							
Asia:							
Arabian Peninsular States, n. e. s.	116						116
Iran	123						123
Kuwait	26,163				183		26,346
Saudi Arabia	13,973			695	157		14,825
State of Bahrein				774	307		1,081
Total	40,375			1,469	647		42,491
Grand total	172,736	782	270	2,816	122,553	7,512	306,669
Imports into United States Territories and possessions from foreign countries:							
Alaska		(5)					(5)
Hawaii				418	33		451
Puerto Rico		71	25	18	2,404		2,518
Total		71	25	436	2,437		2,969
Total net imports into continental United States	172,736	711	245	2,380	120,116	7,512	303,700

[1] Compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of U. S. Department of Commerce
[2] Includes naphtha and benzol.
[3] Includes quantities imported free of duty for supply of vessels and aircraft.
[4] Includes quantities imported free of duty for manufacture in bond and export, and for supply of vessels and aircraft.
[5] Less than 500 barrels.
[6] Revised figure.
[7] Revised to none.

TABLE 87.—Mineral oils, crude and refined, imported into continental United States, 1949–50,[1] by months

[Thousands of barrels]

Year and class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1949													
Crude petroleum	14,131	12,547	11,085	11,952	12,669	11,678	12,988	12,472	10,845	15,242	13,036	15,041	153,686
Refined products:													
Gasoline, finished													
Kerosine													
Distillate fuel oil	116		2		280	382	219	195	245	179	145	62	1,825
Residual fuel oil	5,131	4,296	4,939	5,537	4,966	5,385	5,813	5,985	7,185	8,181	7,597	10,160	75,175
Lubricating oil													
Paraffin wax													
Asphalt	102	53	41	97	39	158	142	67	132	176	133	45	1,185
Unfinished oil, other	6	5	324	288	276	324	226	371	386	545	457	480	3,688
Total	19,486	16,901	16,391	17,874	18,230	17,927	19,388	19,090	18,793	24,323	21,368	25,788	235,559
1950[2]													
Crude petroleum	15,102	11,499	14,614	15,336	13,618	14,931	15,076	15,539	15,760	15,809	13,992	16,438	177,714
Refined products:													
Gasoline, finished			1	1	3	2	4	3	2	134	4	2	156
Kerosine	245												245
Distillate fuel oil	61	30	53	98	90	225	508	526	168	88	237	256	2,340
Residual fuel oil	10,101	7,087	11,606	10,417	9,342	9,043	8,325	9,105	9,061	10,632	11,778	12,689	119,186
Asphalt	66	6	127	73	72	233	222	257	144	279	141	175	1,795
Unfinished oil, other	486	540	545	726	628	700	841	585	630	832	576	624	7,713
Total	26,061	19,162	26,946	26,651	23,753	25,134	24,976	26,015	25,765	27,774	26,728	30,184	309,149

[1] Imports of crude as reported to Bureau of Mines; imports of refined products compiled from records of U. S. Department of Commerce; figures may differ slightly from those used in other sections of this chapter.
[2] Preliminary figures.

Exports.—Exports and shipments to Territories of mineral oils, crude and refined, decreased 7 percent from 1949 to 1950. Continental United States continued to be a net importer of mineral oils, as the excess of all petroleum imports over all petroleum exports rose from 122.6 million barrels in 1949 to 197.8 million in 1950. The excess of crude-petroleum imports increased from 122 million barrels in 1949 to 138 million in 1950, and the excess of residual-fuel-oil imports over exports rose from 63 million barrels in 1949 to 104 million in 1950. Although exports of the other refined products (excluding residual fuel oil) decreased considerably owing to the competition of the new and enlarged European and Middle East refineries and to increased domestic demand, they still exceeded imports by 43 million barrels in 1950 compared with 62 million barrels in 1949.

Exports of crude petroleum increased 5 percent from 1949 to 1950. Canada continued to be the principal country of destination, receiving 91 percent of the total in 1949 and 88 percent in 1950. Cuba received 5 percent in both years, but shipments to Argentina almost tripled those of 1949. European countries took 3 percent of the total in 1949 and 4 percent in 1950. Japan was the only country in Asia receiving any appreciable amount of United States crude in 1950. None was shipped to the Territories.

Exports and Territorial shipments of all refined mineral oils were 12 percent lower than in 1949. Motor-fuel exports decreased 37 percent and kerosine 18 percent from 1949. Outgoing shipments of the other refined products increased over 1949; the largest increase was in shipments of residual fuel oil, which were 28 percent higher than in 1949.

Motor-fuel exports and Territorial shipments decreased 14.6 million barrels from 1949. The decreases were general, but greatest in shipments to Europe and to countries of North America. Shipments to Mexico, Colombia, Mozambique, Union of South Africa, and the Territories were, however, an exception to the general decline. Motor-fuel exports to Europe decreased 9.4 million barrels from 1949. Notable decreases from 1949, by country, were: United Kingdom, 76 percent; France, 76 percent; and Sweden, 72 percent. Motor-fuel shipments to Canada declined 39 percent; to Netherlands Antilles, over 48 percent; and to Cuba, 20 percent.

Outgoing shipments of kerosine also decreased from 1949, except for shipments to El Salvador, United Kingdom, Philippine Islands, Mozambique, the Union of South Africa, and the Territories.

Exports and Territorial shipments of distillate fuel oil increased 3 percent from 1949 to 1950. Gains were confined mostly to North American countries, especially Canada, whereas exports to Europe decreased 38 percent from 1949, with shipments to the United Kingdom only half of the 1949 total.

Increased shipments of residual fuel oil to Canada, Central America, Mexico, Chile, Alaska and Hawaii more than offset smaller shipments to Europe and Eastern Asia.

Exports and Territorial shipments of lubricating oil were 10.5 percent higher in 1950 than in 1949. Increased shipments to Europe, especially to the United Kingdom, accounted for most of the increase.

TABLE 88.—Crude petroleum and major petroleum products exported from the United States, in 1950, by countries of destination, and shipments to and exports from United States Territories and possessions, in thousands of barrels [1] [2]

[U. S. Department of Commerce]

Destination	Crude petroleum	Motor fuel [2] [3]	Kerosine	Distillate oil	Residual oil	Lubricating oil [3]	Wax	Total
North America:								
Bermuda		56	1	13		2		72
Canada	30,708	5,048	477	5,401	4,498	419	110	46,661
Canal Zone		93	28	406	793	5		1,325
Cuba	1,829	1,685	(4)	335	980	108	25	4,962
El Salvador		104	13	123	201	5	5	451
Guatemala		44	5	213	573	13	28	876
Mexico		3,024	93	392	2,171	324	225	6,229
Netherlands Antilles		935			(4)	38		973
Trinidad and Tobago		(4)	(4)			13	(4)	13
Other North America		50	6	99	194	72	14	435
Total	32,537	11,039	623	6,982	9,410	999	407	61,997
South America:								
Argentina	661	114				212	13	1,000
Bolivia		(4)	(4)	85	16	10	10	121
Brazil		250	31	21	(4)	495	34	831
Chile		4	(4)	82	1,965	69	13	2,133
Colombia		36	(4)			36	153	225
Peru		151				24	30	205
Uruguay		26				47	4	77
Venezuela		3				123	38	164
Other South America		4	2	4		22	14	46
Total	661	588	33	192	1,981	1,038	309	4,802
Europe:								
Belgium-Luxembourg		73	(4)	23		807	42	945
Denmark		163	1	219		249	5	637
France	546	245		750		371	16	1,928
Germany		12		74	92	76	1	255
Greece		80	32	15		70	2	199
Italy	243	103	(4)			600	144	1,090
Netherlands		(4)	9	231	(4)	416	10	666
Norway		69	(4)			102	9	180
Portugal		2				49	16	67
Sweden		305	24	590	52	260	19	1,250
Switzerland		38	(4)	64		112	22	236
United Kingdom	441	1,926	339	1,167	74	2,316	46	6,309
Yugoslavia	62	168				89	8	327
Other Europe		111				311	25	447
Total	1,292	3,295	405	3,133	218	5,828	365	14,536
Asia:								
Hong Kong		3		(4)		64	46	113
India	(4)	(4)	1	(4)		594	(4)	595
Japan	334	4	(4)		71	12	5	426
Pakistan		(4)		13		62	(4)	75
Philippines		29	96	7	7	147	28	314
Taiwan		88				34	1	123
Turkey		166	29			85	2	282
Other Asia		31	(4)	30	90	515	10	676
Total	334	321	126	50	168	1,513	92	2,604
Africa:								
Algeria		59				55		114
Belgian Congo		1				41	(4)	42
French Equatorial Africa		57	4	15	10	13		99
French Morocco		23				27	9	59
French West Africa		60	14	11	98	38	(4)	221
Gold Coast		(4)				26		26
Mozambique		73	46	5		57	(4)	181
Tunisia		24				17	(4)	41
Union of South Africa		343	34	23		306	6	712
Other Africa	(4)	87	10	31		288	5	421
Total	(4)	727	108	85	108	868	20	1,916

For footnotes, see end of table.

TABLE 88.—Crude petroleum and major petroleum products exported from the United States, in 1950, by countries of destination, and shipments to and exports from United States Territories and possessions, in thousands of barrels [1] [2]—Continued

[U. S. Department of Commerce]

Destination	Crude petroleum	Motor fuel [2] [3]	Kerosine	Distillate oil	Residual oil	Lubricating oil [2]	Wax	Total
Oceania:								
Australia	--------	12	(4)	--------	--------	512	2	526
New Zealand	--------	8	1	2	(4)	143	(4)	154
Other Oceania	--------	36	15	39	--------	5	--------	95
Total	--------	56	16	41	(4)	660	2	775
Grand total	34,824	[2] 18,928	1,311	10,483	11,885	[2] 13,616	1,195	[2] 92,242
Shipments from continental United States to the Territories and possions:								
Alaska and Hawaii [5]	--------	3,723	176	2,129	4,334	120	(6)	10,482
Puerto Rico	--------	1,888	581	204	--------	61	(4)	2,734
Virgin Islands	--------	33	9	12	--------	5	--------	59
Wake	--------	260	(4)	15	--------	2	--------	277
Other	--------	47	9	18	6	3	--------	83
Total	--------	5,951	775	2,378	4,340	191	(4)	13,635
Exports from the Territories and possessions to foreign countries:								
Alaska	--------	105	6	207	--------	(4)	--------	318
Puerto Rico	--------	6	2	(4)	(4)	(4)	--------	8
Total	--------	111	8	207	(4)	(4)	--------	326
Total net shipments from continental United States	34,824	[2] 24,768	2,078	12,654	16,225	[2] 13,807	1,195	[2] 105,551

[1] Compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce. Changes for 1948 in Mineral Yearbook, 1948, pp. 1018–1020, are as follows, in thousands of barrels: Fuel oil exported to Canada, 9,380; total North America, 15,791; grand total, 27,920. Motor fuel—New Zealand, 408; total Oceania, 1,286; grand total, 32,700. Lubricating oils—Australia, 599; New Zealand, 174; total Oceania, 778; grand total, 12,855. Shipments from continental United States to the Territories, in thousands of barrels: Alaska and Hawaii (figures represent shipments from refining companies for export to Alaska and Hawaii through Pacific ports, as reported to Bureau of Mines by shippers)—motor fuel, 2,919; kerosine, 172; fuel oil, 6,261; and lubricating oil, 90. Total shipments from continental United States to the Territories—motor fuel, 4,697; kerosine, 606; fuel oil, 6,500; and lubricating oil, 140. Total net shipments from continental United States—motor fuel, 37,337; kerosine, 3,529; fuel oil, 34,250; and lubricating oil, 12,994.

Changes in table 88, Minerals Yearbook, 1949, p. 989, are as follows, thousands of barrels: Lubricating oil—India, 1,052; total Asia, 2,310; grand total, 12,318. Total all products—India, 1,336; Asia, 4,942; grand total, 100,672. Shipments from continental United States to the Territories, in thousands of barrels: Alaska and Hawaii (figures represent shipments from refining companies for export to Alaska and Hawaii through Pacific coast ports, as reported to Bureau of Mines by shippers)—motor fuel, 3,523; kerosine, 175; distillate oil, 2,241; residual oil, 4,001; lubricating oil, 114; and total, 10,144. Total shipments from continental United States to the Territories—motor fuel, 5,603; kerosine, 713; distillate oil, 2,452; residual oil, 4,094; lubricating oil, 176; and total, 13,038. Total net shipments from continental United States—motor fuel, 39,388; kerosine, 2,534; distillate oil, 12,297; residual oil, 12,642; lubricating oil, 12,492; and total, 113,452.

[2] Country and continent totals exclude but grand totals include, 2,902 thousand barrels of motor fuel and 2,710 thousand barrels of lubricating oils, for which country breakdown may not be published for security reasons.

[3] Includes natural gasoline, naphtha, benzol, and antiknock compounds of petroleum origin.

[4] Less than 500 barrels.

[5] Figures represent shipments from refining companies for export to Alaska and Hawaii through Pacific coast ports, as reported to Bureau of Mines by shippers.

[6] Not separately recorded.

TABLE 89.—Mineral oils, crude and refined, shipped from continental United States, including shipments to the Territories, 1949–50, by classes and months [1]

[Thousands of barrels]

Year and class	January	February	March	April	May	June	July	August	September	October	November	December	Total
1949													
Crude petroleum	2,127	1,942	1,866	3,655	2,872	3,071	2,866	3,403	2,619	2,916	3,010	2,722	33,069
Refined products:													
Motor fuel [2]	3,995	3,660	4,081	3,832	4,231	3,528	2,399	4,020	2,613	2,867	2,262	1,859	39,347
Kerosine	255	505	213	310	290	82	120	196	134	111	161	156	2,533
Distillate fuel oil	1,546	1,246	1,685	1,271	866	869	694	1,034	832	846	875	531	12,295
Residual fuel oil	1,047	967	1,196	871	1,314	1,037	1,191	811	745	1,193	1,046	1,223	12,641
Lubricants	1,113	912	1,197	1,087	1,353	948	1,046	1,168	931	1,027	787	1,343	12,912
Paraffin wax	95	113	98	85	93	68	65	63	77	80	86	108	1,031
Coke	239	229	201	204	282	173	249	237	150	210	182	115	2,480
Asphalt	123	117	162	191	148	131	42	150	141	181	75	108	1,569
Liquefied gases	106	103	112	79	90	115	114	122	124	100	91	123	1,279
Miscellaneous oils	23	20	16	24	14	13	20	13	17	21	16	23	220
Total refined	8,542	7,872	8,961	7,954	8,681	6,964	5,940	7,814	5,773	6,636	5,581	5,589	86,307
Total crude and refined	10,669	9,814	10,827	11,609	11,553	10,035	8,806	11,217	8,392	9,552	8,591	8,311	119,376
1950 [3]													
Crude petroleum	2,130	2,196	2,153	2,968	2,946	3,226	3,250	3,096	2,654	4,033	3,229	2,917	34,798
Refined products:													
Motor fuel [2]	1,597	1,895	1,691	2,357	2,227	1,914	1,992	1,585	2,380	2,340	2,047	2,491	24,516
Kerosine	107	190	286	95	169	35	131	141	195	163	284	247	2,043
Distillate fuel oil	876	1,193	1,152	1,033	874	895	1,116	967	1,061	1,339	1,112	943	12,561
Residual fuel oil	1,178	977	1,604	1,201	1,270	1,844	1,299	1,639	1,189	898	1,402	1,726	16,227
Lubricants	982	1,201	1,167	1,303	1,200	958	1,121	1,146	1,330	1,057	1,274	1,490	14,229
Paraffin wax	113	87	70	86	74	89	85	113	135	112	121	110	1,195
Coke	97	66	80	185	206	157	294	180	339	436	256	198	2,494
Asphalt	91	41	88	54	175	80	83	40	121	82	65	62	982
Liquefied gases	109	140	114	133	114	118	158	121	165	137	151	171	1,631
Miscellaneous oils	18	25	17	20	18	19	24	21	25	22	15	26	250
Total refined	5,168	5,815	6,269	6,467	6,327	6,109	6,303	5,953	6,940	6,586	6,727	7,464	76,128
Total crude and refined	7,298	8,011	8,422	9,435	9,273	9,335	9,553	9,049	9,594	10,619	9,956	10,381	110,926

[1] Compiled from records of U. S. Department of Commerce; figures may differ slightly from those used throughout other sections of this chapter.
[2] Includes benzol, natural gasoline, and antiknock compounds.
[3] Preliminary figures.

WORLD PRODUCTION

World production of crude petroleum in 1950 resumed its long-range upward trend, being 11.5 percent larger than in 1949. Except for Rumania, all major producing countries of the world increased production over 1949.

The Western Hemisphere's proportion of world crude-petroleum production declined from 73.4 percent in 1949 to 71.6 percent in 1950. The United States furnished 54 percent of the world output in 1949 and 52 percent in 1950. Venezuela maintained its position as the second largest producing country, furnishing 14 percent of the total in both 1949 and 1950. The Middle East (Bahrein Island, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, Turkey, and Egypt) increased its share from 15 percent in 1949 to 17 percent in 1950, surpassing for the first time the Caribbean area in crude-petroleum production.

Crude production in the United States increased 7 percent from 1949 to 1950. Owing to much larger output in Alberta, Canada increased its output nearly 37 percent; and late in the year crude began moving through the Interprovincial Pipeline to Lake Superior. Mexico's production continued its steady climb, being 19 percent larger in 1950 than in the previous year. Colombia's production gained nearly 15 percent with the installation of new pumping facilities on the Andian pipeline which carries crude from interior fields to Mamonal on the Caribbean Sea. Brazil more than doubled 1949 production from the Bahia fields. Chile, with development of the Cerro Manatiales field, was able to export about two-thirds of its production.

TABLE 90.—World production of crude petroleum, by countries, 1944–50, in thousands of barrels

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950 [1]
North America:							
Barbados	1	2	1	(2)	(2)	(2)	---
Canada	10,099	8,483	7,586	7,692	12,287	21,305	29,146
Cuba [3]	109	149	269	[4] 300	[4] 159	[4] 206	[4] 156
Mexico	38,203	43,547	49,235	56,284	58,508	60,910	72,443
Trinidad	22,139	21,093	20,233	20,521	20,111	20,617	20,632
United States	1,677,904	1,713,655	1,733,939	1,856,987	2,020,185	1,841,940	1,971,845
Total North America	1,748,455	1,786,929	1,811,263	1,941,784	2,111,250	1,944,978	2,094,222
South America:							
Argentina	24,230	22,881	20,604	21,846	23,734	22,589	23,353
Bolivia	314	382	363	377	464	678	616
Brazil	58	79	67	97	144	109	278
Chile	---	---	---	---	---	---	629
Colombia	22,291	22,449	22,118	24,794	23,792	29,722	34,059
Ecuador	2,967	2,664	2,323	2,282	2,563	2,617	2,632
Peru	14,389	13,744	12,468	12,764	14,069	14,790	15,077
Venezuela	257,046	323,156	388,486	434,905	490,015	482,316	546,783
Total South America	321,295	385,355	446,429	497,065	554,781	552,821	623,427

For footnotes, see end of table.

TABLE 90.—World production of crude petroleum, by countries, 1944–50, in thousands of barrels—Continued

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950 [1]
Europe:							
Albania	334	[4] 267	[4] 1,000	[4] 2,000	[4] 1,500	[4] 2,188	[4] 2,335
Austria	8,218	3,074	5,734	6,285	6,149	[4] 6,100	[4] 6,150
Czechoslovakia	[4] 185	91	196	210	204	292	[4] 292
France	[4] 300	202	368	356	369	411	909
Germany	6,154	3,935	4,539	4,032	4,489	5,947	7,904
Hungary	[5] 6,277	[5] 5,018	5,146	4,330	3,647	3,791	[4] 4,198
Italy	55	53	83	81	71	71	63
Netherlands [6]	12	41	435	1,478	3,443	4,314	4,897
Poland	[4] 3,000	[7] 750	866	951	[4] 1,039	[4] 1,205	[4] 1,205
Rumania	26,191	34,772	31,434	28,552	[4] 34,000	[4] 33,700	[4] 32,000
U. S. S. R.[4] [8]	275,000	148,953	157,673	187,463	218,000	237,700	266,200
United Kingdom	703	532	412	351	323	338	340
Yugoslavia	220	200	160	290	270	470	780
Total Europe [8]	326,649	197,888	208,046	236,379	273,504	296,527	327,273
Asia:							
Bahrein Island	6,714	7,309	8,010	9,411	10,915	10,985	11,016
Burma	[4] 750	[4] 725	15	59	341	248	[4] 450
China	505	484	513	374	533	730	[4] 730
Formosa	40	14	16	22	23	22	23
India	2,784	2,363	2,193	1,863	1,875	1,906	[4] 1,867
Indonesia	22,260	7,600	2,100	8,020	[9] 31,900	[9] 44,932	[9] 50,148
Iran	102,045	130,526	146,819	154,998	190,384	204,712	242,475
Iraq	30,943	35,112	35,665	35,834	26,115	30,957	49,919
Japan	1,601	1,544	1,343	1,276	1,122	1,353	2,048
Kuwait			5,931	16,225	46,500	90,000	125,722
Pakistan	(10)	(10)	(10)	356	490	824	800
Qatar						750	12,268
Sarawak and Brunei	[4] 6,000	2,100	2,050	12,970	20,124	25,108	30,958
Saudi Arabia	7,794	21,311	59,944	89,852	142,853	174,008	199,547
Turkey						95	54
U. S. S. R.: Sakhalin [4]	5,000	6,000	6,000	7,000	7,000	7,000	7,000
Total Asia [8]	186,436	215,088	270,599	338,260	480,175	593,630	735,025
Africa:							
Algeria	4	2	1	1	1	2	24
Egypt	9,416	9,406	9,070	8,627	13,398	15,997	16,373
French Morocco	32	26	20	21	100	136	305
Total Africa	9,452	9,434	9,091	8,649	13,499	16,135	16,702
Oceania:							
Australia (Victoria)					1	1	2
New Zealand	2	3	2	2	2	7	7
Total Oceania	2	3	2	2	3	8	9
Grand total	2,592,289	2,594,697	2,745,430	3,022,139	3,433,212	3,404,099	3,796,658

[1] Preliminary figures.
[2] Less than 500 barrels.
[3] Natural naphtha and gas oil.
[4] Estimate.
[5] Data represent Trianon Hungary after October 1944.
[6] Data revised in accordance with recent information stating 6.948 barrels per metric ton.
[7] Beginning in 1945, postwar borders.
[8] U. S. S. R. in Asia (except Sakhalin) included with U. S. S. R. in Europe.
[9] Includes New Guinea, whose production amounted to 1,725,500 barrels in 1949 and 1,748,000 barrels in 1950.
[10] Included with India.

In Western Europe, Germany increased production 33 percent from 1949 to 1950, and Netherlands output was almost 14 percent larger than in 1949. France more than doubled 1949 production with development of the Lacq field in the Aquitanian Basin.

For Eastern Europe, reliable statistics are generally lacking. The U. S. S. R. (including Sakhalin) apparently increased its production from 1949 to 1950, as did Albania, Hungary, and Yugoslavia. Rumania, however, is estimated to have had lower production in 1950 than in 1949.

The largest gains in petroleum production were in the Middle East. Iraq, with completion of the new 16-inch-diameter pipeline to Tripoli, Lebanon, produced 61 percent more petroleum in 1950 than in 1949. Kuwait produced from its Burghan field 40 percent more petroleum than in 1949. Iran, the largest producer of the Middle East, increased its output 18 percent from 1949 to 1950, while Saudi Arabia's production was up nearly 15 percent. The Trans-Arabian pipeline from Qaisumah in north central Arabia to Sidon, Lebanon, was placed in operation during December 1950, with a daily delivery capacity exceeding 500,000 barrels. Qatar completed its first full year as a commercial producer and exporter of crude petroleum in 1950. In Egypt, greater output from the Asl field more than offset declines in the older producing fields.

In the Far East, Japanese crude-petroleum production showed a notable increase in 1950; and, although the United States of Indonesia increased output 12 percent from 1949 to 1950, it had not regained prewar levels. In British Borneo, production increased 23 percent from 1949 to 1950.

Phosphate Rock

By Bertrand L. Johnson and Nan C. Jensen

GENERAL SUMMARY

MINED production of phosphate rock in the United States in 1950 reached a record high of 11,114,159 long tons, thus exceeding the previous record (9,388,160 tons in 1948) by nearly 1¾ million tons, according to reports submitted by producers to the Bureau of Mines. Increases were shown in Florida, Tennessee, and most of the Western States. Supplies of phosphate rock were plentiful and large quantities were added to the stocks in producers' hands.

Sales likewise increased, rising from 8,986,933 long tons in 1949 to 10,253,552 tons in 1950. (See fig. 1.) Increased sales in Florida and Tennessee counterbalanced the decline in sales in the Western States. The total value of the phosphate rock sold or used in 1950 rose to $59,027,848, or about $7,600,000 over 1949. The P_2O_5 content of the rock sold or used in 1950 increased to a new record high of 3,336,112 long tons from 2,913,796 tons in 1949. Imports in 1950 increased both in quantity and value. Exports in 1950 were likewise above those in 1949 in both quantity and value. Apparent domestic consumption rose considerably to 8,580,925 long tons. Stocks at the end of 1950 had increased greatly in all the producing areas.

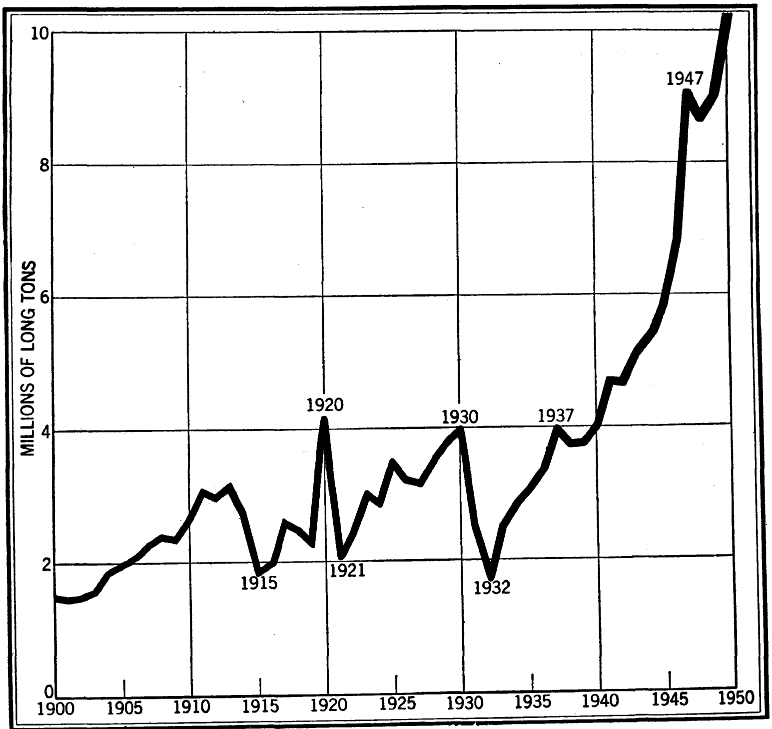

FIGURE 1.—Marketed production of domestic phosphate rock ,1900–50.

TABLE 1.—Salient statistics of the phosphate-rock industry in the United States, 1949–50

	1949				1950			
	Long tons		Value at mines		Long tons		Value at mines	
	Rock	P_2O_5 content	Total	Average	Rock	P_2O_5 content	Total	Average
Production (mined)	8,877,474	2,866,897	([1])	([1])	11,114,159	3,565,793	([1])	([1])
Sold or used by producers:								
Florida:								
Land pebble	6,715,097	2,265,780	$37,339,985	$5.56	7,933,009	2,673,882	$44,430,646	$5.60
Soft rock	77,088	15,652	344,787	4.47	81,542	16,994	408,595	5.01
Hard rock	23,804	8,522	173,211	7.28	71,319	25,133	538,601	7.55
Total Florida	6,815,989	2,289,954	37,857,983	5.55	8,085,870	2,716,009	45,377,842	5.61
Tennessee [2]	1,344,470	377,081	9,067,589	6.74	1,384,473	390,190	10,028,404	7.24
Idaho and Wyoming [3]	471,305	133,794	1,915,125	4.06	573,044	163,272	2,125,065	3.71
Montana	355,169	112,967	2,574,330	7.25	210,165	66,641	1,496,537	7.12
Total United States	8,986,933	2,913,796	51,415,027	5.72	10,253,552	3,336,112	59,027,848	5.76
Imports	64,891	([1])	821,842	12.66	87,173	([1])	1,113,974	12.78
Exports [4]	1,316,819	([1])	8,005,521	6.08	1,759,800	([1])	10,364,550	5.89
Apparent consumption	7,735,005	([1])			8,580,925	([1])		
Stocks in producers' hands Dec. 31: [4]								
Florida	[5] 871,000	[5] 291,000	([1])	([1])	1,357,000	421,000	([1])	([1])
Tennessee	[5] 593,000	[5] 168,000	([1])	([1])	612,000	174,000	([1])	([1])
Western States	[5] 44,000	[5] 14,000	([1])	([1])	303,000	80,000	([1])	([1])
Total stocks	[5] 1,508,000	[5] 473,000	([1])	([1])	2,272,000	675,000	([1])	([1])

[1] Data not available.
[2] Includes a small quantity from Virginia in 1949.
[3] Includes Utah in 1950.
[4] As reported to the Bureau of Mines by domestic producers.
[5] Revised figure.

Several general papers relating to the phosphate-rock industry have appeared recently.[1]

DOMESTIC PRODUCTION

Mined production of phosphate rock in the United States in 1950 (11,114,159 long tons) was much larger than that of 1949 (8,877,474 tons) and even exceeded the former record high (9,388,160 tons) of 1948 by about 1,726,000 tons.

SALES

An increase of over a million tons in the quantity of phosphate rock sold or used by domestic producers brought the total for the United States in 1950 to a record high of 10,253,552 long tons with a record value of $59,027,848.

[1] McConnell, Duncan, The Petrography of Rock Phosphate: Jour. Geol., vol. 58, 1950, pp. 16–23.
McKelvey, V. E., and Nelson, J. M., Characteristics of Marine Uranium-Bearing Sedimentary Rocks: Econ. Geol., vol. 45, No. 1, January–February 1950, pp. 35–53.
Jacob, K. D., World Resources: Phosphorus: Am. Fertilizer, vol. 112, No. 10, May 13, 1950, pp. 8 and 26. (From paper presented before the United Nations Scientific Congress on the Conservation and Utilization of Resources, Lake Success, New York, Aug. 17–Sept. 6, 1949.) Phosphate Resources and Manufacturing Facilities in the United States: Soil Science Society of America, Short course in Fertilizer Technology, Univ. of Maryland, College Park, Md., Aug. 21–25, 1950.
Barr, J. A., Phosphate: Eng. and Min. Jour., vol. 152, No. 2, February 1951, pp. 98–100.
Fulton, C. A., Phosphate Rock: Am. Inst. Min. and Met. Eng., Ind. Minerals and Rocks, 2d ed., New York, 1949, pp. 661–683.

TABLE 2.—Phosphate rock mined in the United States, 1941–50, by States, in long tons

Year	Florida	Tennessee [1]	Western States	United States	Year	Florida	Tennessee [1]	Western States	United States
1941	3,417,900	1,301,067	203,216	4,922,183	1946	5,280,402	1,316,107	572,330	7,168,839
1942	2,984,503	1,568,162	266,273	4,818,938	1947	6,381,282	1,489,980	1,239,727	9,110,989
1943	3,274,266	1,868,407	227,294	5,369,967	1948	7,184,297	1,499,547	704,316	9,388,160
1944	3,486,482	1,413,246	300,274	5,200,002	1949	6,695,407	1,403,469	778,598	8,877,474
1945	3,814,935	1,260,849	323,955	5,399,739	1950	8,597,227	1,472,017	1,044,915	11,114,159

[1] Includes a small quantity of apatite from Virginia in 1941–47 and 1949, and in 1941–43 some matrix of washer grade.

TABLE 3.—Phosphate rock sold or used by producers in the United States, 1945–50

Year	Long tons	Value at mines		Year	Long tons	Value at mines	
		Total	Average			Total	Average
1945	5,806,723	$23,951,077	$4.12	1948	8,668,769	$50,501,598	$5.83
1946	6,860,713	31,043,821	4.52	1949	8,986,933	51,415,027	5.72
1947	9,027,030	46,638,837	5.17	1950	10,253,552	59,027,848	5.76

TABLE 4.—Phosphate rock sold or used by producers in the United States in 1949–50, by grades and States

Grades—B. P. L.[1] content (percent)	Florida		Tennessee [2]		Western States		Total United States	
	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total
1949								
Below 60	82,420	1	556,024	41	163,365	20	801,809	9
60 to 66	32,013	(3)	305,172	23	38,362	4	375,547	4
68 basis, 66 minimum	254,810	4	341,819	26	332,010	40	928,639	10
70 minimum	1,062,628	16	138,570	10	252,876	31	1,454,074	16
72 minimum	1,254,545	18			39,861	5	1,294,406	15
75 basis, 74 minimum	2,706,992	40	667	(3)			2,707,659	30
77 basis, 76 minimum	1,422,581	21					1,422,581	16
Above 85 (apatite) Undistributed			2,218	(3)			2,218	(3)
Total	6,815,989	100	1,344,470	100	826,474	100	8,986,933	100
1950								
Below 60	153,539	2	440,488	32	226,391	29	820,418	8
60 to 66			299,228	22	818	(3)	300,046	3
68 basis, 66 minimum	507,827	6	536,522	39	300,131	38	1,344,480	13
70 minimum	868,016	11	88,957	6	251,469	32	1,208,442	12
72 minimum	1,446,706	18	18,736	1	4,400	1	1,469,842	14
75 basis, 74 minimum	3,064,690	38	542	(3)			3,065,232	30
77 basis, 76 minimum	2,045,092	25					2,045,092	20
Above 85 (apatite)								
Total	8,085,870	100	1,384,473	100	783,209	100	10,253,552	100

[1] Bone phosphate of lime, $Ca_3(PO_4)_2$.
[2] Includes a small quantity from Virginia in 1949.
[3] Less than 0.5 percent.

REVIEW BY STATES

SOUTHERN STATES

Florida.—The upward trend in the marketed production of Florida phosphate rock continued in 1950; a new high of 8,085,870 long tons valued at $45,377,842 was attained. By far the greater part of the production came from the land-pebble field. Relatively small quantities of hard rock and soft rock (waste-pond phosphates from the hard-rock field) were produced. The output of soft rock was somewhat larger than of hard rock.

The following companies mined and shipped phosphate rock in 1950:

Land pebble:

American Agricultural Chemical Corp., 50 Church St., New York, N. Y. (Pierce, Fla.)
American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y. (Brewster, Fla.)
Coronet Phosphate Co., 19 Rector St., New York, N. Y. (Plant City, Fla.)
Davison Chemical Corp., Baltimore, Md. (Bartow, Fla.)
International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill. (Mulberry and Bartow, Fla.)
Swift & Co., R. F. D. 1, Box 200, Bartow, Fla.
Virginia-Carolina Chemical Corp., P. O. Drawer 1797, Richmond 14, Va. (Nichols, Fla.)

Hard rock:

Kibler-Camp Phosphate Enterprise, P. O. Box 608, Ocala, Fla.

Soft rock:

Colloidal Phosphate Co., P. O. Box 1588, Tampa, Fla.
Kellogg Co., Hernando, Fla.
Loncala Phosphate Co., Box 338, High Springs, Fla.
Sea Board Phosphate Co., Dunnellon, Fla.
Soil Builders, Inc., Dunnellon, Fla. (Hernando, Fla.)
Superior Phosphate Co., Box 476, Dunnellon, Fla.

TABLE 5.—Florida phosphate rock sold or used by producers, 1946–50, by kinds

Year	Hard rock			Soft rock [1]		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1946	100,881	$762,127	$7.55	97,067	$387,708	$3.99
1947	79,330	618,330	7.79	88,620	326,064	3.68
1948	48,198	368,586	7.65	69,335	293,927	4.24
1949	23,804	173,211	7.28	77,088	344,787	4.47
1950	71,319	538,601	7.55	81,542	408,595	5.01

Year	Land pebble			Total		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1946	4,807,563	$19,867,339	$4.13	5,005,511	$21,017,174	$4.20
1947	6,314,077	31,975,858	5.06	6,482,027	32,920,252	5.08
1948	6,421,725	37,070,381	5.77	6,539,258	37,732,894	5.77
1949	6,715,097	37,339,985	5.56	6,815,989	37,857,983	5.55
1950	7,933,009	44,430,646	5.60	8,085,870	45,377,842	5.61

[1] Includes material from waste-pond operations.

The American Agricultural Chemical Corp. operated its No. 3 and No. 12 mines and washers, its recovery and reclaim units, and its drier at Pierce. It is reported to have installed an elemental-phosphorus electric furnace of 8,000- to 10,000-kw. capacity at Pierce. The American Cyanamid Co. reports that it operated both its Saddle Creek and Sydney mines and washers and dried the phosphate rock produced at its Brewster drier.

The Sydney property of the American Cyanamid Co. is in Hillsborough County, 15 miles east of Tampa, on State Highway 60. In December 1949, a plant was put in operation there to be served by the Seaboard Airline Railroad. A description of the plant has been published. According to a published description, the plant includes the world's largest settling basin served by a single mechanical unit for reclaiming water from process flows. This is a 300-foot-diameter special Dorr thickener mechanism, incorporating a flocculating feed well and picket arms, installed in a 750-foot-diameter earthen basin with sloped bottom, yielding an underflow with 14-percent solids and a clear-water overflow.[2] At Brewster the company installed a new type of wet storage ahead of the drying plant to lower the moisture content of the wet pebble and concentrates. A belt stacker will take feed from incoming hopper cars and deposit it on a radial pile. The phosphate will be reclaimed by belt conveyors in tunnels underneath, which elevate and convey it to the drying plant.

The Armour Fertilizer Works (350 Hurt Bldg., Atlanta, Ga.) states that there were no mining operations at its Florida plant near Bartow. The Coronet Phosphate Co. operated its Eleanor mine, washer, and flotation plant in 1950, drying the phosphate rock produced in its Coronet drier. A considerable tonnage of defluorinated phosphate rock was produced and shipped by this company. The Coronet Phosphate Co. is moving its mining operations from Hillsborough County to a site in Polk County about 6 miles northeast of Lakeland. Actual mining operations are to begin there in 1951. The Davison Chemical Corp. operated its Bonny Lake and Pauway No. 4 mines and washers and dried the washed phosphate rock at its Ridgewood drying plant.

The International Minerals & Chemical Corp. operated its Achan, Noralyn, and Peace Valley mines and washers and its Noralyn and Prairie driers in 1950. During the year the company installed Humphreys spirals to re-treat flotation table tails at the Peace Valley plant. In 1950 the Federal Communications Commission granted a permit for installing a radio-communications system at the company open-pit phosphate mines in Florida. A two-way conversational set is reported to operate on a 60-watt base station near the main shop. Of 16 mobile units, 14 will be in automobiles used by maintenance personnel, and 2 will be placed on draglines. The system will operate on the 152- to 162-mc. band, using frequency modulation.[3] All International's Florida office and service centers are being moved to the Bartow area. The company is planning to produce uranium for the Atomic Energy Commission from Florida phosphate deposits.

[2] Crago, Arthur, Three New Steps in Treating Florida Phosphate Rock: Eng. and Min. Jour., vol. 151, No. 11, November 1950, pp. 79–83.

[3] Mining Congress Journal, Open-Pit Communication: Vol. 36, No. 9, September 1950, p. 63. Engineering and Mining Journal, Radio for Florida Phosphate Mines: Vol. 151, No. 6, June 1950, p. 104.

The Pembroke Chemical Corp. (Pembroke, Fla.) reports that it made no production of land-pebble phosphate rock in 1950 and that it had no stocks at the end of that year. Swift & Co. operated its Swift No. 5 and Swift No. 6 mines and washers, drying the phosphate rock at its Agricola drying plant. The Virginia-Carolina Chemical Corp. operated its Homine and Clear Springs mines and washers and mined feed from the Phosmico debris dumps. The Phosmico and Nichols drying plants were in operation. Some phosphate rock was calcined. A large dragline recently installed at the Florida mines of this company has been described in its house organ.[4]

In the hard-rock phosphate field the Kibler-Camp Phosphate Enterprise (P. O. Box 608, Ocala, Fla., and P. O. Box 67, Lakeland, Fla.) operated the Section 12 mine. This property was formerly worked under the names of C. & J. Camp, Inc., and J. Buttgenbach & Co., with D. B. Kibler, Jr., as manager. The latter has acquired the interest formerly held by the Belgian partner. The company drying plant at Fernandina was moved some time ago to the mine, where both wet and dry storage facilities are now available. A Bucyrus-Erie 6 W Diesel-driven dragline is said to have been bought to handle the hard overburden, which cannot be hydraulicked effectively. Shipments were made in 1950 for domestic consumption in the manufacture of elemental phosphorus, ferrophosphorus, phosphoric acid, and various phosphate chemicals, and for export.

The Bureau of Land Management, United States Department of the of the Interior, requested bids in 1950 on the leasing of 130 acres of phosphate land in Florida. Two tracts, one of 80 acres in Citrus County, 4 miles southwest of Inverness, and one in Hernando County, 1 mile west of South Catherine, were offered, at a minimum bid of $25 on each tract, to qualified bidders of the highest cash amount per acre as a bonus for the privilege of leasing.[5]

Several soft-rock phosphate mining companies were in operation in 1950, mining the fine-grained phosphatic residues in the old waste-pond dumps near Dunnellon, Hernando, and High Springs in the hard-rock phosphate field. Part of this material was sold for use as a phosphate fertilizer for direct application to the soil, some for use as a filler in commercial mixed or complete fertilizers, and a portion for stock and poultry feed.

It has been known for some time that uranium occurs as a minor component in certain of the phosphate rock deposits of Florida. The land-pebble phosphate rock is the only type that contains uranium. In the high-grade part of the land-pebble district, in Polk and Hillsborough Counties, the uranium occurs principally in the Bone Valley formation. The fresh, unweathered Hawthorn formation contains little or no uranium, but leached Hawthorn, rich in P_2O_5, contains a small amount of uranium. The Pleistocene sands have no uranium, except where they contain reworked phosphatic material from the Bone Valley formation. South of the high-grade district these formations contain only minor amounts of uranium. The uranium seems to be associated with the phosphate.[6]

The Atomic Energy Commission has announced that it has de-

[4] V-C News, She's a Queen: Vol. 3, No. 6, June-July 1950, pp. 4-9.
[5] American Fertilizer, Bids Asked on Florida Phosphate Leases: Vol. 113, No. 5, Sept. 2, 1950, p. 11.
[6] Engineering and Mining Journal, Uranium Found in Florida Phosphate Limited to Certain Deposits: Vol. 151, No. 8, August 1950, p. 93.

veloped a process (secret) for economic extraction of the uranium of phosphate rocks during the production of triple superphosphate. The International Minerals & Chemical Corp. plans to erect a large plant in Florida to produce defluorinated phosphate for the animal-feed-manufacturing industry and multiple superphosphate for the fertilizer industry. The recovery of uranium compounds will be an additional step in these processes.

Submarine deposits of rock phosphate have been found along the Gulf coast of peninsular Florida over a 25-mile area in the vicinity of Tampa, possibly extending as far south as Fort Myers. Little is known about them, and the possibility that they could be exploited commercially is considered "remote." [7]

The results of a study to determine the age and the relationships of the land-pebble phosphate-rock deposits to the Pleistocene terraces appeared in 1950. It was concluded that no relationship exists and that, instead of the presence of several phosphate-bearing terrace deposits, as postulated by Vernon, the phosphate gravels appeared to be a continuous beach placer deposit resting unconformably on a very irregular limestone surface.[8] A more general study of the land-pebble deposits was also published during the year.[9]

South Carolina.—In March 1950 the new elemental-phosphorus 12,000-kv-a. electric furnace of the Virginia-Carolina Chemical Corp. at Charleston, S. C., was completed, and production of elemental phosphorus was begun. Previously the corporation had bought phosphorus to make its high-purity phosphoric acid and various phosphate chemicals. This carbon-arc electric furnace uses Florida high-grade hard-rock phosphate. This rock is charged directly into the furnace without the sintering or nodulizing needed for the Florida land-pebble or the Tennessee brown-rock phosphates. Its lower iron content ties up less phosphorus in the form of ferrophosphorus in the smelting operations than do other phosphate rocks with higher iron contents. Low-cost power for the plant is obtained from the Santee-Cooper Project. A description of the plant has been published.[10]

Tennessee.—Tennessee remains the second-largest phosphate-rock-producing State. In 1950 the quantity of phosphate rock sold or used by Tennessee producers was 40,003 long tons greater than in 1949, rising from 1,344,470 long tons in that year to 1,384,473 tons in 1950. The total value in 1950 increased $960,815 over that of 1949 and rose to $10,028,404, according to reports from the producing companies.

Tennessee brown-rock phosphate-mining operations in 1950 were carried on by the following organizations:

Armour Fertilizer Works, Room 350, Hurt Bldg., Atlanta, Ga. (Columbia, Tenn.)
Federal Chemical Co., 634 Starks Bldg., Louisville, Ky. (Mount Pleasant, Tenn.)
Harsh Phosphate Co., Arlington Ave., Nashville 10, Tenn. (Nashville, Tenn.)
Hoover & Mason Phosphate Co., 8 S. Michigan Ave., Chicago, Ill. (Mount Pleasant, Tenn.)
International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill. (Columbia, Tenn.)

[7] Science News Letter, Phosphate Deposits Found Off Florida Coast: Vol. 57, No. 13, Apr. 1, 1950, p. 196.
[8] MacNeil, F. S., Pleistocene Shore Lines in Florida and Georgia: Geol. Survey Prof. Paper 221–F, 1950, pp. 95–107.
[9] Cathcart, J. B., Notes on the Land Pebble Phosphate Deposits of Florida: Proc. Symposium on Mineral Resources of the Southeastern United States, Univ. of Tennessee, 1949, Knoxville, Tenn., 1950, pp. 132–151.
[10] Callahan, J. R., How Virginia-Carolina Makes Phosphorus by Sound Engineering; One-Unit Process Four-Unit Operations: Chem. Eng., vol. 58, No. 4, April 1951, pp. 102–106.

Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo. (Monsanto, Tenn.)
Owens Agricultural Phosphate Corp., Centerville, Tenn. (Centerville, Tenn.)
Tennessee Valley Authority, Div. of Chemical Engineering, Wilson Dam, Ala. (Columbia, Tenn.)
Virginia-Carolina Chemical Corp., Drawer 1797, Richmond 14, Va. (Mount Pleasant, Tenn.)

TABLE 6.—Tennessee phosphate rock[1] sold or used by producers, 1945–50

Year	Long tons	Value at mines		Year	Long tons	Value at mines	
		Total	Average			Total	Average
1945	1,294,297	$6,062,688	$4.68	1948	1,307,507	$8,231,251	$6.30
1946	1,362,600	7,014,490	5.15	1949	1,344,470	9,067,589	6.74
1947	1,411,884	7,779,099	5.51	1950	1,384,473	10,028,404	7.24

[1] Includes small quantity of Tennessee blue rock in 1945–47 and Virginia apatite in 1945–47 and 1949.

The Tennessee brown-rock phosphate deposits were described in a short article published during the year.[11]

The Tennessee Valley Authority continued its mining and phosphate-processing activities in Tennessee and technologic operations at its chemical plant, Muscle Shoals, Ala., in 1950.

According to the annual report of the TVA for the fiscal year ended June 30, 1950, all the TVA output of elemental phosphorus in the fiscal year 1950 was used in producing concentrated superphosphate and calcium metaphosphate fertilizers and dicalcium phosphate, a mineral feed supplement for livestock. The output of concentrated superphosphate in the fiscal year 1950 was 125,400 tons, making a total production of 1,160,000 tons. The process for manufacturing calcium metaphosphate, the most concentrated phosphate fertilizer yet made on a large scale, is now being demonstrated in a large-scale plant at Muscle Shoals. TVA has distributed about 93,300 tons of this material, chiefly for testing. In the fiscal year 1950, 6,600 tons were sold, while 9,600 tons were used in test demonstrations.

TVA discontinued the manufacture of dicalcium phosphate at the close of the 1950 fiscal year, since the material, a mineral supplement for stock feed, was becoming available from private industry. After 6½ years of operation, TVA had produced 171,800 tons of dicalcium phosphate, including 49,440 tons in the 1950 fiscal year. Complete information on TVA's manufacturing process and marketing channels was turned over to a number of potential producers. At the end of the fiscal year 1950, two companies had begun producing feed-grade dicalcium phosphate, and several others had indicated that they expected to enter this field.

During the year major research emphasis was placed on a group of related processes that produce nitrogen-phosphate or nitrogen-phosphate-potash fertilizers of high concentration. Pilot-plant developments on two of the processes were in advanced stages.

The TVA plant at Columbia, Tenn., produced about 17,500 tons of fused tricalcium phosphate during the fiscal year 1950, virtually all of the material being used for tests and farm demonstrations. Five years' production has totaled about 100,000 tons. The process is

[11] Burwell, H. B., Brown Phosphate Rock in Tennessee: Proc. Symposium on Mineral Resources of the Southeastern United States, Univ. of Tennessee, Knoxville, Tenn., 1950, pp. 128–131.

basically simple, requiring no sulfuric acid, coke, or large amounts of electricity, and it can use relatively low grades of phosphate rock to produce a fertilizer containing 26 to 30 percent plant food. It is economically suitable for distribution within a short distance of the plant.

Several reports dealing with TVA studies were published recently.[12]

The Monsanto Chemical Co. reported in June that a new electric furnace (its sixth) for producing elemental phosphorus, with a capacity of 25,000 kw., was to be erected at its plant at Monsanto, Tenn. It is stated that this will be the largest elemental-phosphorus electric furnace in the world. The phosphorus produced is to be hauled by tank car to processing plants at Trenton, Mich., and Carondelet, Mo., for the manufacture of phosphate chemicals. At Monsanto, Tenn., the company has installed a plant to absorb all the fluorine-containing gas from the electric furnace gases, to eliminate possible damage by these gases in the vicinity of the plant. The calcium fluoride formed is being stored in a waste pond.

The Victor Chemical Works, Chicago, Ill., continued to produce elemental phosphorus at its electric furnace plant at Mount Pleasant, in the Tennessee brown-rock field. Phosphate rock from its recently acquired deposits in the Melrose, Mont., field was shipped to this plant for smelting.

WESTERN STATES

Total marketed production of Western States phosphate rock fell considerably in 1950 from the 1949 level according to reports from producers to the Bureau of Mines, declining from 826,474 long tons in 1949 to 783,209 tons in 1950. The total value also declined, dropping from $4,489,455 in 1949 to $3,621,602 in 1950. Phosphate rock was produced in all four States of the western field—Idaho, Montana, Utah, and Wyoming. Montana sales declined. (See figure 2.) The combined total sales of the other States rose considerably but not enough to offset the drop in Montana.

Idaho.—Idaho retained its position as the leading phosphate-rock producer of the Western States in 1950, increasing its output in quantity over 1949 but showing a decline in value owing to the considerable quantities of lower-grade phosphate rock produced. Totals for the State cannot be given without disclosing the output of individual companies.

Only two companies reported producing phosphate rock in Idaho in 1950. The larger producer remains the Simplot Fertilizer Co., Pocatello, Idaho, which continued its open-pit operations at the Gay mine on Fort Hall Indian Reservation, Bingham County, about 16 miles east of Fort Hall. The high-grade phosphate rock from this property is used by that company for producing superphosphate at Pocatello. The low-grade phosphatic shales from this operation go to the Westvaco elemental phosphorus electric furnaces at Pocatello.

The Anaconda Copper Mining Co. operated its No. 3 mine at Conda, Caribou County, Idaho, processing the phosphate rock produced at the company plant at Anaconda, Mont., largely to high-

[12] Staff of Division of Chemical Engineering, TVA, Development of Processes for Production of Concentrated Superphosphates: Chem. Eng. Rept. 5 (compiled by G. L. Bridger, Wilson Dam, Ala.), 1949, 172 pp. Agglomeration of Phosphate Fines for Furnace Use: Chem. Eng. Rept. 4 (compiled by E. L. Stout, Wilson Dam, Ala.), 1950, 124 pp. Phosphorus: Properties of the Element and Some of Its Compounds: Chem. Eng. Rept. 8 (compiled by T. D. Farr, Wilson Dam, Ala.), 1950, 93 pp.

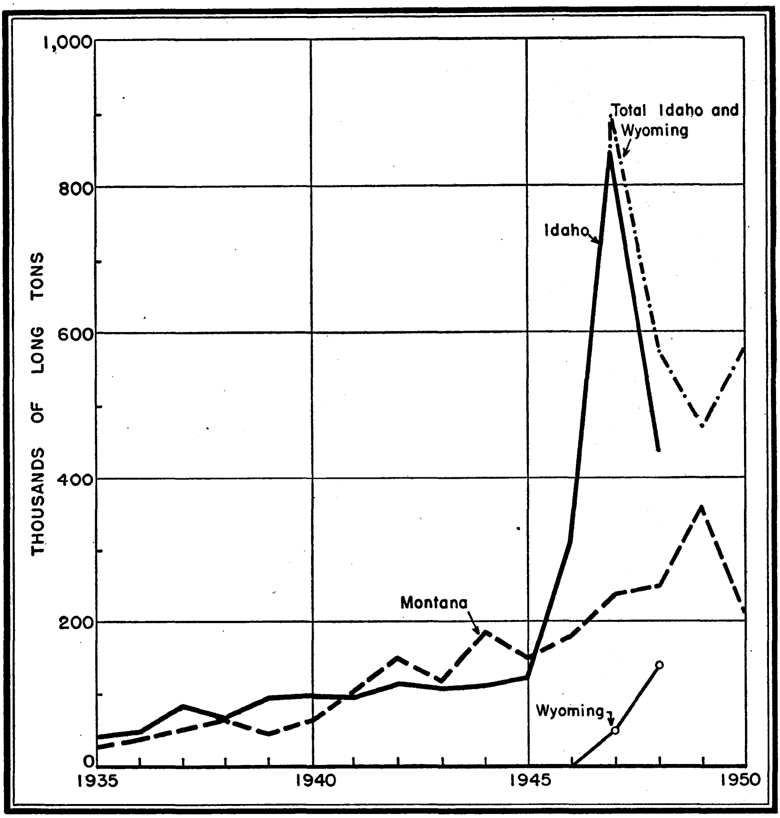

FIGURE 2.—Idaho, Montana, and Wyoming phosphate rock sold or used by producers, 1935–50.

TABLE 7.—Western States phosphate rock sold or used by producers, 1946–50

Year	Idaho [1]			Montana		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1946	312,658	$1,805,103	$5.77	179,944	$1,207,054	$6.71
1947	845,045	4,077,885	4.83	236,229	1,571,117	6.65
1948	434,375	2,122,089	4.89	248,683	1,720,254	6.92
1949	471,305	1,915,125	4.06	355,169	2,574,330	7.25
1950	573,044	2,125,065	3.71	210,165	1,496,537	7.12

Year	Wyoming			Total		
	Long tons	Value at mines		Long tons	Value at mines	
		Total	Average		Total	Average
1946				492,602	$3,012,157	$6.11
1947	51,845	$290,484	$5.60	1,133,119	5,939,486	5.24
1948	138,946	695,110	5.00	822,004	4,537,453	5.52
1949	(1)	(1)	(1)	826,474	4,489,455	5.43
1950	(1)	(1)	(1)	783,209	3,621,602	4.62

[1] Idaho includes Utah in 1946–48 and 1950, and Wyoming in 1949–50.

analysis superphosphate. A smaller quantity went into the manufacture of phosphoric acid and phosphate chemicals.

The company has installed a beneficiation unit at the mine for washing about 450 tons a day of phosphate-bearing material from a

7½-foot hanging-wall bed, formerly left unmined. The mill flow sheet includes crushing to ⅜-inch in a hammer mill, washing in a rotary scrubber, dewatering in drags with a vacuum pan at the discharge, and drying in rotary driers. Water will be recovered in a thickener.[13]

The San Francisco Chemical Co., Montpelier, Idaho, reported that there were no operations of any kind in 1950 at Waterloo mine on the slopes of Waterloo Hill, 5 miles east of Montpelier.

The Westvaco Chemical Division, Food Machinery & Chemical Corp., finished installing its second electric furnace for the production of elemental phosphorus at Pocatello, Idaho, early in 1950. Both furnaces were in operation in that year. Its first electric furnace, completed in 1949, was the first electric furnace for producing elemental phosphorus to be installed west of the Mississippi River to operate on the Idaho phosphate-rock deposits. In the fall of 1950 a third furnace was begun, and erection of a fourth is said to be planned for 1951. Power for these furnaces is obtained from the Snake River, Idaho, hydroelectric plants of the Idaho Power Co. The phosphatic raw material for the elemental phosphorus furnaces is the low-grade phosphatic shale from operations of the J. R. Simplot Co. on the Fort Hall Indian Reservation.

The elemental phosphorus is shipped in tank cars to Westvaco's Carteret, N. J., and Newark, Calif., plants, for conversion. A new plant is to be built at Lawrence, Kans., 35 miles west of Kansas City, Kans., to process the phosphorus into soluble phosphates to meet the demand in the Midwestern and Mountain States. Additional capacity for producing phosphate chemicals is being provided at the Newark, Calif., plant. Virtually all the output of elemental phosphorus of this Pocatello, Idaho, plant is to be converted into the so-called "molecularly dehydrated" sodium and potassium phosphates, such as "sodium tripolyphosphate" and tetrasodium pyrophosphate. None of the elemental phosphorus is expected to be converted into fertilizers. Some phases of the Westvaco phosphorus operations were discussed recently.[14]

The treble superphosphate plant of the Gem State Phosphate Co. (Idaho Farm Bureau-Gates Bros., Inc.) was in operation in 1950. No phosphate rock was mined by this company, that which was used being purchased from the San Francisco Chemical Co. A new evaporator was erected at the Wendell plant, and an ammonium phosphate plant is planned.

The property of the Teton Phosphate Co., Inc., Montpelier, Idaho, was inactive during 1950.

The Central Farmers Fertilizer Association of Chicago is reported to be actively engaged in developing phosphate rock deposits in Georgetown Canyon.

The Western Fertilizer Association—a group of eight Northwest cooperatives—holder of a Federal phosphate lease on Dry Ridge phosphate-rock deposits near Soda Springs, plans to construct a large phosphate-fertilizer plant but has not yet undertaken any plant construction, and the location of the proposed plant has not been

[13] Barr, J. A., Phosphate: Eng. and Min. Jour., vol. 152, No. 2, February 1951, pp. 98–100.

[14] Miller, J. G., Elemental Phosphorus and the Commercial Importance of the Molecularly Dehydrated Phosphates: Paper presented at Seattle, Wash., meeting, Am. Inst. Min. and Met. Eng., Apr. 6, 1950, 6 pp. (mim.).

determined. The Pacific Supply Cooperative, Portland, Oreg., is reported to be the major stockholder of this group.

A description of the Deer Creek Wells Canyon phosphate area was published in 1950.[15]

Montana.—Marketed production of Montana phosphate rock in 1950 reversed its recent upward trend and declined to 210,165 long tons, valued at $1,496,537, from 355,169 tons, valued at $2,574,330, both the lowest since 1946.

The Montana Phosphate Products Co., Trail, British Columbia, operated its Anaconda, Anderson, and Graveley mines, as well as several Government leases, all in the Garrison district, Powell County. The rock shipped from these mines was exported to the plant of the parent company at Trail, British Columbia. Mining operations were also carried on by George Relyea at the Relyea mine, also in the Garrison district, and the output was also shipped to Trail, British Columbia. Anderson Bros. Mining Co., Box 382, Helena, Mont., reports the production in 1950 of a small tonnage of phosphate rock at the Warm Springs mine in the Garrison district.

In the Philipsburg district, Granite County, Soluble Phosphates, Ltd., Maxville, Mont., reports that its mine was inactive throughout the year. The International Minerals & Chemical Corp., 20 North Wacker Drive, Chicago, Ill., states that its operations on its property in this district were restricted in 1950 to keeping its mine and plant in shape and maintaining watchman service. No other operations have been reported in this district.

The Victor Chemical Works, Chicago, Ill., began initial operations early in August 1950 toward construction of an elemental-phosphorus electric-furnace plant near Silver Bow, a few miles west of Butte, at the junction of the Union Pacific, Northern Pacific, and Chicago, Milwaukee & St. Paul Railroads. Completion of the plant is expected late in 1951. In 1947 and 1948 the Victor Chemical Works acquired two properties in the Melrose district, the public domain formerly leased to the Anderson Phosphate Mines, Inc., and the Martin Phosphate Mining Co., from which the phosphate rock for the electric furnaces will be obtained. Until the new plant is completed the phosphate rock from the mine, the first this company has operated, will be sent to the company electric furnaces at Mount Pleasant, Tenn., or Tarpon Springs, Fla. In 1950 several hundred tons were shipped to the Mount Pleasant plant. Eventually the phosphate rock will be transported by rail from the mine to the furnaces at Silver Bow. The elemental phosphorus produced will be shipped to company plants in Illinois and California for manufacture into phosphoric acid and phosphate chemicals. Power for the new plant will eventually be supplied by the Bonneville Power Administration from the Hungry Horse Dam, which is expected to be ready in the fall of 1952. Until then power will be furnished by the Montana Power Co.[16]

The phosphate-rock deposits of parts of Beaverhead and Madison Counties, Mont., are described in a recent report.[17]

[15] Deiss, Charles, Phosphate Deposits of the Deer Creek-Wells Canyon area, Caribou County, Idaho: Geol. Survey Bull. 955-C, 1949 (1950), pp. 61-101.

[16] Chemical and Engineering News, Victor Chemical Works to Produce Phosphorus in Montana: Vol. 29, No. 2, Jan. 8, 1951, p. 118.

[17] Klepper, M. R., A Geologic Reconnaissance of Parts of Beaverhead and Madison Counties, Montana: Geol. Survey Bull. 969-C, 1950 (1951), pp. 55-85.

Utah.—The only phosphate-rock-producing company in Utah in 1950 was the Pearl & Toland Phosphate Co. (307 South Central Ave., Ontario, Calif.), reported as a partnership consisting of F. J. Pearl and C. C. Toland. This company succeeded the F. J. Pearl Minerals Co. and operated its property at the south end of the Crawford Mountains in Rich County, northeastern Utah, near Woodruff. Some of the rock mined was shipped for stock and poultry feed and for direct application to the soil.

The Garfield Chemical & Manufacturing Corp., Salt Lake City, Utah, which has in the past produced metallurgical phosphate rock from a Federal lease in the Spanish Fork Canyon area in Utah County, near Thistle Junction, Utah, did not operate the mine in 1950. The Utah Phosphate Co., Morgan, Utah, is reported as not in operation in 1950 and not to have made any sales.

The Monsanto Chemical Co., St. Louis, Mo., is reported to have obtained an option to purchase a large acreage of phosphate-bearing land early in 1950 in the Vernal region, in Utah's Uintah Basin, from the Humphreys Phosphate Co., of Denver, Colo., and adjacent ground from J. H. Ratliff.

Wyoming.—The reported production and shipments of Wyoming phosphate rock in 1950 showed a great increase over the 1949 figures both in quantity and value; still in third place among the Western States group, the State remains an important producer.

Only one company was producing phosphate rock in Wyoming in 1950—the San Francisco Chemical Co., operating the Leefe mine on land leased from the Stauffer Chemical Co. in the Beckwith Hills syncline, 3½ miles west of Sage, in Lincoln County, Wyo., a station on the main line of the Union Pacific Railroad in southwestern Wyoming.

No phosphate rock was produced in 1950 from the mine of Phosphate Mines, Inc., Kemmerer, Wyo., but a small tonnage was shipped from stock for direct application to the soil. The shut-down of mining operations here is reported to be temporary.

Late in 1950 it was reported that the Continental Sulphur & Phosphate Corp., Dallas, Tex., was planning to develop phosphate-rock deposits in the Lander, Wyo., region.

Several publications of interest in connection with the development of the Wyoming phosphate-rock deposits appeared in 1950.[18]

California.—California does not produce any phosphate rock, but phosphate fertilizers have been produced there, as well as phosphate chemicals from phosphoric acid; elemental phosphorus was shipped into the State from more eastern points. The phosphate chemical plant of the Victor Chemical Works, Chicago, Ill., is at South Gate, Calif., near Los Angeles and that of the Westvaco Chemical Division, Food Machinery & Chemical Corp., is at Newark, Calif. The Kaiser Aluminum & Chemical Corp., Permanente, Calif., formerly the Permanente Metals Co., produced a fused calcium-magnesium-phosphate fertilizer from serpentine and Idaho phosphate rock.

---

[18] Thompson, R. M., Troyer, M. L., White, V. L., and Pirirings, George, Geology of the Lander Area, Central Wyoming: Geol. Survey Map OM-112, Oil and Gas Investigation Series, September 1950 (2 sheets, each 41 by 54 inches).

Van Houten, F. B., Geology of the Western Part of the Beaver Divide Area, Fremont County, Wyo.: Geol. Survey Map OM-113, Oil and Gas Investigation Series, October 1950 (1 sheet, 41 by 51 inches).

Wyoming Geological Association, Guidebook, 5th Annual Field Conference, Southwest Wyoming: Casper, Wyo., Aug. 8-11, 1950, 196 pp. Contains many data on Wyoming geology and a short paper by K. L. Cochran on Wyoming Phosphate Industry, pp. 133-135.

CONSUMPTION AND USES

The apparent consumption of phosphate rock in the United States in 1950 increased 845,920 tons to a record high of 8,580,925 long tons, from 7,735,005 tons in 1949.

TABLE 8.—Apparent consumption[1] of phosphate rock in the United States, 1945–50, in long tons

Year	Long tons	Year	Long tons
1945	5, 457, 648	1948	7, 700, 081
1946	6, 221, 525	1949	7, 735, 005
1947	7, 425, 784	1950	8, 580, 925

[1] Quantity sold or used by producers plus imports minus exports.

Data regarding the sales of phosphate rock by uses both for individual States and for the United States are shown in table 9.

TABLE 9.—Phosphate rock sold or used by producers in the United States, 1949–50, by uses and States

Uses	Florida		Tennessee[1]		Western States		Total United States	
	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total	Long tons	Percent of total
1949								
Domestic:								
Superphosphates	4, 965, 060	73	378, 760	28	254, 603	31	5, 598, 423	62
Phosphates, phosphoric acid, phosphorus, ferrophosphorus	342, 282	5	735, 309	55	177, 024	22	1, 254, 615	14
Direct application to soil	522, 310	8	208, 829	16	1, 556	(2)	732, 695	8
Fertilizer filler	6, 269	(2)	12, 546	1			18, 815	(2)
Stock and poultry feed	56, 703	1	5, 533	(2)			62, 236	1
Undistributed[3]			1, 275	(2)	2, 055	(2)	3, 330	(2)
Exports[4]	923, 365	13	2, 218	(2)	391, 236	47	1, 316, 819	15
Total	6, 815, 989	100	1, 344, 470	100	826, 474	100	8, 986, 933	100
1950								
Domestic:								
Superphosphates	5, 483, 159	68	301, 923	22	200, 105	26	5, 985, 187	59
Phosphates, phosphoric acid, phosphorus, ferrophosphorus	407, 735	5	830, 837	60	297, 362	38	1, 535, 934	15
Direct application to soil	562, 993	7	219, 522	16	73, 383	9	855, 898	8
Fertilizer filler	773	(2)	14, 610	1			15, 383	(2)
Stock and poultry feed	81, 665	1	16, 871	1	2, 104	(2)	100, 640	1
Undistributed[3]			710	(2)			710	(2)
Exports[4]	1, 549, 545	19			210, 255	27	1, 759, 800	17
Total	8, 085, 870	100	1, 384, 473	100	783, 209	100	10, 253, 552	100

[1] Includes a small quantity from Virginia in 1949.
[2] Less than 0.5 percent.
[3] Includes phosphate rock used in pig-iron blast furnaces, parting compounds, research, defluorinated phosphate rock, refractories, and other uses.
[4] As reported to the Bureau of Mines by domestic producers.

Certain details regarding the domestic superphosphate industry are shown in table 10.

TABLE 10.—Production, shipments, and stocks of superphosphates (18 percent available phosphoric acid), 1946–50, in short tons

[Bureau of the Census]

	1946	1947	1948	1949	1950
Production	7, 847, 591	9, 292, 677	9, 319, 697	9, 075, 903	9, 296, 051
Shipments	4, 421, 670	4, 752, 324	4, 789, 668	4, 845, 175	5, 065, 101
Stocks in manufacturers' hands Dec. 31	646, 278	856, 382	1, 216, 788	1, 139, 372	1, 050, 718

PRICES

Prices for Florida land-pebble phosphate rock increased slightly during 1950, as shown in table 11. Tennessee brown-rock phosphate, however, showed no changes in the quoted prices, the levels remaining the same as in the second half of 1949. Table 11 gives the price quotations of the Oil, Paint, and Drug Reporter as of January 2, 1950, and January 8, 1951. Tennessee quotations are now on a P_2O_5 basis, instead of the B. P. L. content used in Florida and formerly in Tennessee. Quotations for Western States phosphate rock are not given in the trade journals.

TABLE 11.—Prices per long ton of Florida and Tennessee unground, washed, and dried phosphate rock, in bulk, f. o. b. cars at mine, by grades, in 1950–51

[Oil, Paint and Drug Reporter]

Grades (percent) [1]	Florida land pebble		Tennessee brown rock	
	Jan. 2, 1950	Jan. 8, 1951	Jan. 2, 1950	Jan. 8, 1951
68/66 B. P. L.	$3.75	(2)		
70/68 B. P. L.	4.155	$4.35–4.40		
72/70 B. P. L.	4.805	5.00		
75/74 B. P. L.	5.805	6.00		
77/76 B. P. L.	6.905	7.00		
27–26 P_2O_5			$6.45	$6.45
30–29 P_2O_5			7.21	7.21

[1] B. P. L. signifies bone phosphate of lime, $Ca_3(PO_4)_2$.
[2] Not quoted.

FOREIGN TRADE [19]

Data on imports and exports of phosphate rock and other phosphatic materials at domestic ports as reported by the United States Department of Commerce are shown in tables 12–15.

Sales or shipments of phosphate rock for export as reported by domestic producers to the Bureau of Mines are given in the section on Consumption and Uses.

TABLE 12.—Phosphate rock and phosphatic fertilizers imported for consumption in the United States, 1949–50

[U. S. Department of Commerce]

Fertilizer	1949		1950	
	Long tons	Value	Long tons	Value
Apatite	3,428	$43,002		
Phosphates, crude, not elsewhere specified	61,463	778,840	87,173	$1,113,974
Superphosphates (acid phosphate):				
Normal (standard), not over 25 percent P_2O_5 content	1,273	35,620	4,062	108,842
Concentrated (treble), over 25 percent P_2O_5 content			446	24,094
Total superphosphates	1,273	35,620	4,508	132,936
Ammonium phosphates, used as fertilizer	112,745	7,543,101	95,215	6,059,423
Bone dust, or animal carbon and bone ash, fit only for fertilizer	27,320	1,394,085	40,225	1,869,331
Guano			105	7,228
Slag, basic, ground or unground	94	267	179	4,846
Precipitated bone, fertilizer grade	3,619	247,133	876	62,484

[19] Figures on imports and exports (unless otherwise indicated) compiled by M. B. Price and E. D. Page of the Bureau of Mines, from records of the United States Department of Commerce.

232294—53——65

TABLE 13.—Phosphate rock exported from the United States, 1949–50, by countries of destination and grades

[U. S. Department of Commerce]

	1949		1950	
	Long tons	Value	Long tons	Value
Florida:				
High-grade hard rock:				
Canada	4,308	$51,440	381	$4,572
Colombia	304	5,120		
Sweden	11,550	106,838	[1] 26,743	244,917
Taiwan			4,926	35,589
Total high-grade hard rock	16,162	163,398	32,050	285,078
Land pebble:				
Belgium-Luxembourg	64,176	544,564	73,969	500,059
Brazil	5,000	51,350	2,011	18,099
British Guiana	363	4,752		
Canada	173,437	1,578,767	190,084	1,649,060
Colombia	404	5,595	303	4,155
Costa Rica	90	1,275		
Cuba	16,662	119,052	12,930	96,709
Ecuador	200	2,390		
El Salvador	132	1,478	2,700	21,627
Germany	173,158	1,315,049	117,129	863,048
Israel			12,236	103,673
Italy	54,939	485,156	394,977	3,539,448
Japan	[1] 139,926	[1] 719,681	530,036	2,904,867
Korea	9,842	82,131		
Mexico	3,130	15,495	9,008	54,173
Netherlands	77,438	669,150	93,522	888,605
Sweden	17,596	158,364	10,107	90,412
Switzerland	9,020	81,180		
Taiwan			24,646	187,701
United Kingdom	82,533	576,745	87,875	783,312
Uruguay	1,994	21,755		
Total land pebble	[1] 830,040	[1] 6,433,929	1,561,533	11,704,948
Other phosphate rock: [2]				
Canada	351,385	4,191,958	237,215	2,866,378
Colombia	850	12,908		
El Salvador	270	3,296	528	5,401
Japan	[1] 59,207	[1] 598,963		
Mexico	46	641	559	6,720
Norway			100	2,664
Philippines	2	148		
Siam			9	219
Venezuela			54	3,060
Total other phosphate rock	[1] 411,760	[1] 4,807,914	238,465	2,884,442
Grand total	1,257,962	[1] 11,405,241	1,832,048	14,874,468

[1] Revised figure.
[2] Includes colloidal matrix; sintered matrix; soft phosphate rock; and Tennessee, Idaho, and Montana rock.

TABLE 14.—"Other phosphate material" [1] exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Long tons	Value	Year	Long tons	Value
1945	1,732	$140,363	1948	1,002	$188,163
1946	1,018	144,478	1949	3,225	224,375
1947	1,129	220,906	1950	1,350	247,880

[1] Class includes animal carbon; apatite; bone ash, dust, and meal; char dust; duplex basic phosphate; tricalcium phosphate; and defluorinated phosphate rock.

TABLE 15.—Superphosphates (acid phosphates) exported from the United States, 1949–50, by countries of destination

[U. S. Department of Commerce]

Destination	1949		1950	
	Long tons	Value	Long tons	Value
Austria	9,343	$189,941		
Brazil	37,597	812,813	19,936	$417,843
British East Africa	442	33,500		
Canada	135,491	2,393,711	146,397	2,626,295
Chile	103	6,105	9	1,040
Colombia	3,615	254,270	1,384	95,536
Costa Rica	649	35,380	2,416	127,003
Dominican Republic	575	26,983	373	22,425
El Salvador	303	10,732	970	42,329
Germany	20,597	575,522	804	19,200
Guatemala	180	7,457	98	5,291
Iceland			1,889	110,355
Japan	9,643	151,206		
Korea	63,970	1,096,359	28,569	747,149
Mexico	55	2,744	185	20,045
Palestine	688	40,296		
Philippines	186	8,549	1,596	115,997
Poland-Danzig			14,514	212,275
Union of South Africa	22,330	344,133		
Venezuela	94	3,645	75	4,557
West Indies:				
British:				
Leeward and Windward Islands	259	7,405	20	604
Other British	121	3,131	4	225
Cuba	8,335	236,913	22,887	492,976
Haiti	4	304	125	7,863
Other countries	1,408	85,610	311	15,117
Total	315,988	6,326,709	242,562	5,084,125

TECHNOLOGY

Among the significant papers published in 1950 on developments in phosphate-rock technology, in addition to those listed under the Tennessee Valley Authority operations, were the following:

Kingery, W. D., Fundamental Study of Phosphate Banding in Refractories: I. Literature Review: Jour. Am. Ceram. Soc., vol. 33, No. 8, Aug. 1, 1950, pp. 239–241. II. Cold-Setting Properties: Jour. Am. Ceram. Soc., vol. 33, No. 8, August 1950, pp. 242–247. III. Phosphate Absorption by Clay and Bond Migration: Jour. Am. Ceram. Soc., vol. 33, No. 8, August 1950, pp. 247–250.

Phosphorus Work Group of the National Soil and Fertilizer Research Committee, Summary of Phosphorus Research in the United States Relating to Soils and Fertilizers: Wash., D. C., 1950, 150 pp. (mim.).

Mann, V. I., A Spot Test for Phosphorus in Rocks: Jour. Sedimentary Petrology, vol. 20, No. 2, June 1950.

Thompson, Dudley, Ultrasonic Coagulation of Phosphate Tailing: Virginia Polytechnic Inst. Bull., Eng. Exp. Sta. Ser. 75, 1950, 77 pp.

Moulton, R. W., Greaves, G. S., and Hebner, P. G., Phosphate Fertilizer by the Fusion of Phosphate Rock and Olivine: Paper pres. at Ann. Meeting, Div. of Fertilizer Chemistry, Am. Chem. Soc., Chicago, Ill., Sept. 4, 5, and 6, 1950. (Abs. in Am. Fertilizer and Allied Chemicals, vol. 113, No. 7, Sept. 30, 1950, p. 10.)

Bridger, G. L., and Brunsting, E. H., Acidulation Characteristics of Certain Western Phosphate Rocks: Paper pres. at Ann. Meeting, Div. of Fertilizer Chemistry, Am. Chem. Soc., Chicago, Ill., Sept. 4, 5, and 6, 1950. (Abs. in Am. Fertilizer and Allied Chemicals, vol. 113, No. 7, Sept. 30, 1950, p. 10.)

Colls, E. A. G., Corrosion-Resistant Materials and Coatings in Trail Chemical Operations: Trans. Am. Inst. Min. and Met. Eng., vol. 187, No. 4, April 1950, Min. Eng., pp. 491–494.

Jacob, K. D., USDA and Fertilizer Technology: Commercial Fertilizer, vol. 80, No. 5, May 1950, pp. 21–27, 42, and 56.

Swaminathan, V. S., The Thomas Centenary: Mining Mag. (London), vol. 82, No. 5, May 1950, pp. 268–270.

Specht, R. C., and Herron, W. E., Jr., Lightweight Aggregate from Phosphate Slimes: Rock Products, vol. 53, No. 5, May 1950, pp. 96–97.

Worsnop, F. E., and Kingsburg, A., Prevention of Corrosion of Galvanized Iron by Glassy Metaphosphates: Chem. Eng. and Min. Rev., vol. 42, No. 5, Feb. 10, 1950, pp. 173–176.

Crowther, E. M., The Analysis of Phosphate Fertilizers: Chem. and Ind. (London), No. 48, Dec. 2, 1950, pp. 763–766.

Greger, H. H., New Bonds for Refractories: Aluminum Phosphates: Brick and Clay Record, vol. 117, No. 21, August 1950, pp. 63 and 68.

WORLD REVIEW

Table 16 gives available figures on production of phosphate rock in various countries in recent years.

TABLE 16.—World production of phosphate rock by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Algeria	401,304	584,827	713,790	670,591	645,906	684,657
Angaur Island	(2)	59,557	107,898	76,713	157,049	[3] 119,000
Australia	9,344	20	5,402	2,170	11	(2)
Austria	(2)	3,240	11,525	(2)	(2)	(2)
Belgium	17,990	69,927	58,045	68,938	44,643	50,846
Brazil (apatite)	7,463	10,421	5,592	(2)	4,553	(2)
British Borneo (guano)	(2)	204	283	427	508	(2)
Canada	271	52	--------	--------	18	117
Chile (apatite)	13,203	15,210	13,994	59,529	49,311	13,437
Christmas Island (Indian Ocean) (exports)	[3] 6,096	34,444	106,765	108,311	255,236	(2)
Egypt	349,374	294,046	371,227	377,005	350,480	397,207
France	75,459	97,285	104,068	84,580	67,509	73,752
French Morocco	1,654,120	2,783,580	2,960,735	3,226,700	3,693,000	3,872,250
French West Africa (aluminum phosphate)	--------	--------	853	3,965	5,675	11,035
Germany: Federal Republic	[3] 500	[3] 400	698	473	(2)	(2)
India	532	247	867	1,132	588	(2)
Indochina	10,000	10,000	(2)	(2)	(2)	(2)
Indonesia	2,032	--------	--------	--------	[3] 5,000	--------
Ireland	22,110	12,189	10,780	(2)	(2)	(2)
Israel and Jordan (exports)	4,867	4,024	6,058	[3] 4,000	(2)	(2)
Italy	1,600	--------	--------	(2)	(2)	(2)
Japan	(2)	7,985	6,802	3,590	684	258
Makatea Island (French Oceania) (exports)	259,000	241,085	196,430	183,104	239,532	245,804
Nauru Island (exports)	--------	58,575	177,606	544,298	802,070	1,070,358
Netherlands Antilles	10,421	78,675	79,229	58,827	92,784	104,240
New Zealand	8,084	11,224	203	--------	--------	(2)
Ocean Island (exports)	--------	29,669	212,456	126,854	265,087	251,218
Philippines (guano)	--------	--------	--------	--------	10,998	32,606
Seychelles Islands (exports)	7,090	21,397	14,516	21,722	14,171	10,005
Southern Rhodesia	--------	--------	9	--------	67	36
South-West Africa (guano)	27	1,665	2,223	1,038	957	581
Spain	20,349	18,608	20,204	23,012	23,093	24,080
Sweden (apatite)	171,127	50,730	7,696	1,441	1,604	(2)
Tanganyika Territory	9	279	220	313	157	468
Tunisia	706,404	1,399,880	1,759,236	1,863,710	1,441,918	1,524,800
Uganda	8,648	7,213	7,269	--------	--------	467
Union of South Africa	27,342	37,691	41,831	39,656	56,471	51,844
U. S. S. R. (apatite) [3]	1,626,000	1,626,000	2,032,000	2,336,915	(2)	(2)
United States (sold or used by producers)	5,899,921	6,970,827	9,171,914	8,807,903	9,131,173	10,418,122
Total (estimate) [1]	11,370,000	14,565,000	18,240,000	18,755,000	19,420,000	21,250,000

[1] In addition to countries listed, Cayman Islands (B. W. I.), China (including Formosa), Korea, Madagascar, New Caledonia, Norway, Poland, and Rumania produce phosphate rock; but data of output are not available, and estimates have been included in the total.
[2] Data not available; estimate by author of chapter included in total.
[3] Estimate.

BASIC SLAG

Basic slag is a limited source of agricultural phosphorus in the United States. Domestic production comes from a single company smelting a phosphatic iron ore of the Birmingham, Ala., district. No figures on production or sales are released for publication by this company. Annual imports are negligible. In 1949 only 94 long tons were imported; in 1950, only 179 tons.

Platinum-Group Metals

By James E. Bell and Kathleen M. McBreen

GENERAL SUMMARY

REVERSING a downtrend that had persisted for several consecutive years, the demand for platinum rose sharply in 1950, particularly in the second half. Sales of platinum were the largest since 1945, and the quotation of $103 an ounce that prevailed from September 11 to October 18 was the highest since early 1927. Demand for palladium also was substantially higher, although the quantity of palladium sold was less than half that of platinum. Palladium was quoted at $24 an ounce throughout the year—a price that has persisted since 1940. Demand for iridium, osmium, rhodium, and ruthenium was at a much higher level, with rhodium showing the greatest percentage increase in sales. During the latter part of the year, the demand for platinum exceeded the supply, causing some dealers and refiners to follow a policy of rationing. In general, the increased activity in the platinum-group metals in 1950 was connected with requirements for the military program and expansion of defense-supporting industries.

TABLE 1.—Salient statistics of platinum-group metals in the United States, 1949–50, in troy ounces

	1949	1950
Production:		
Crude platinum from placers and byproduct platinum-group metals	[1] 24,807	[1] 37,855
Refinery production:		
New metal:		
Platinum	42,228	56,757
Palladium	6,008	11,819
Other	3,690	4,553
Total	51,926	73,129
Secondary metal:		
Platinum	41,734	33,894
Palladium	37,209	21,167
Other	4,504	3,052
Total	83,447	58,113
Consumption:		
Platinum	152,658	308,998
Palladium	116,235	150,456
Other	19,730	36,491
Total	288,623	495,945

	1949	1950
Stocks in hands of refiners, importers, and dealers, Dec. 31:		
Platinum	138,049	125,234
Palladium	122,408	107,854
Other	35,587	33,474
Total	296,044	266,562
Imports for consumption:		
Unrefined materials	33,748	48,446
Refined metals	184,536	379,188
Total	218,284	427,634
Exports:		
Ore and concentrates	165	82
Refined metals and alloys, including scrap	40,778	37,699
Manufactures (except jewelry)	20,702	12,640

[1] Includes Alaska.

Refining of platinum in the United States in 1950 was at a rate 8 percent greater than in 1949, and importation of refined platinum was 114 percent greater. Domestic consumption, as measured by sales,

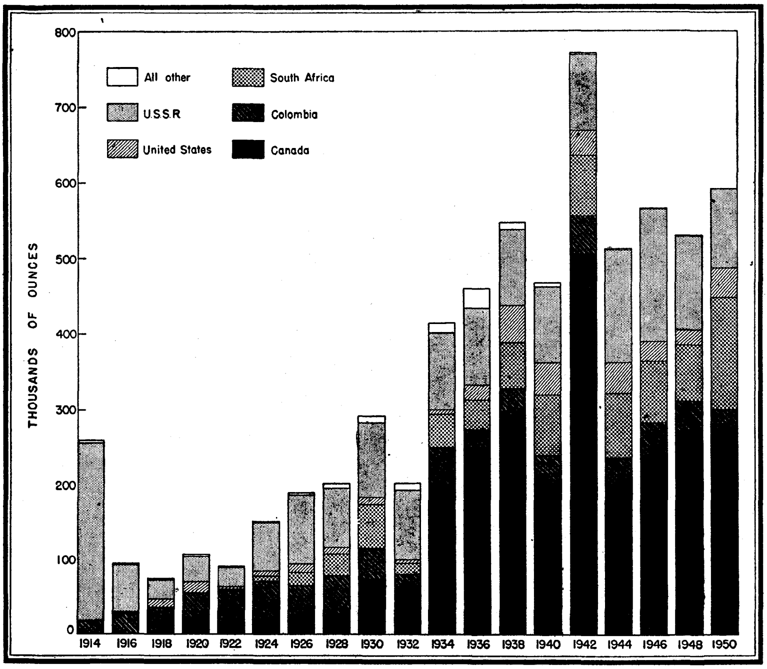

FIGURE 1.—World production of platinum-group metals, 1914–50.

was 102 percent greater, and stocks of refiners and dealers declined 9 percent. The jewelry trade was the largest buyer of platinum in 1950, taking 41 percent of the total sold to domestic consumers, although sales for jewelry and decorative uses were much smaller than those for chemical uses in the fourth quarter of the year.

Refining of palladium in the United States was at a rate 24 percent less than in 1949, but importation of refined palladium was 100 percent greater. Domestic consumption, as measured by sales, was 29 percent higher; the electrical industry was the largest buyer, taking 53 percent. Stocks in the hands of refiners and dealers declined 12 percent.

Slightly more iridium, osmium, and rhodium but considerably less ruthenium were refined in the United States in 1950 than in 1949. Imports of refined iridium, osmium, rhodium, and ruthenium were all much larger. Domestic consumption of the four metals together gained 85 percent, with the chemical industry the largest buyer; stocks in the hands of refiners and dealers declined 6 percent.

Total imports of platinum-group metals into the United States in 1950 were 96 percent higher than in 1949 and were the largest on record.

Figure 1 shows graphically the trend in world production of platinum-group metals since 1914.

CRUDE PLATINUM PRODUCTION

Mine returns indicate a domestic production of 37,855 troy ounces of platinum-group metals in 1950 compared with 24,807 ounces in 1949.

This production includes crude platinum recovered from placer-platinum deposits in the Goodnews Bay district in southwestern Alaska, byproduct crude platinum recovered from gold placer mining in California, and platinum-group metals contained in small quantities in some gold and copper ores and recovered as a byproduct in smelting and refining operations. No production of byproduct crude platinum was recorded in Montana or Oregon in 1950.

Purchases.—Buyers in the United States reported the purchase in 1950 of 69,056 ounces of crude platinum from Alaska, California, Oregon, Colombia, Union of South Africa, British Columbia (Canada), and Ethiopia. In 1949 the corresponding quantity was 50,233 ounces.

RECOVERY OF REFINED PLATINUM-GROUP METALS

New Metals Recovered.—Reports from refiners indicate that 73,129 ounces of new platinum-group metals were recovered in the United States in 1950, a 41-percent increase over the recovery in 1949. Of the new metal recovered in 1950, 57 percent was chiefly from Colombian crude and 22 percent from domestic crude; 21 percent was recovered as a byproduct of gold and copper ores.

Secondary Metals Recovered.—In 1950, 58,113 ounces of secondary platinum-group metals were recovered from the refining of scrap metal, sweeps, etc.—a 30-percent decrease from 1949.

Substantial quantities of worn-out catalysts, spinnerets, laboratory ware, and other products are returned to refiners for refining or reworking. The refined platinum-group metals recovered from these items (or their equivalent in refined metals) are returned to the consumers. The platinum-group metals so recovered are not considered secondary production or included in the statistics of secondary metals.

TABLE 2.—New platinum-group metals recovered by refiners in the United States, 1941–45 (average) and 1946–48, and 1949–50 by sources, in troy ounces

	Platinum	Palladium	Iridium	Osmium	Rhodium	Ruthenium	Total
1941–45 (average)	174,281	62,426	4,394	731	4,626	2,694	249,152
1946	92,947	3,858	2,995	475	1,396	107	101,778
1947	54,011	4,156	1,605	419	563	103	60,857
1948	33,520	4,408	1,009	349	156	149	39,591
1949							
From domestic—							
Crude platinum	12,564	92	1,286	238	144	12	14,336
Gold and copper refining	1,844	5,794					7,638
Total	14,408	5,886	1,286	238	144	12	21,974
From foreign crude platinum	27,820	122	845	742	64	359	29,952
Total recovery	42,228	6,008	2,131	980	208	371	51,926
1950							
From domestic—							
Crude platinum	14,379	37	1,131	278	251	22	16,098
Gold and copper refining	3,722	11,533	93		134	27	15,509
Total	18,101	11,570	1,224	278	385	49	31,607
From foreign crude platinum	38,656	249	1,127	1,017	48	425	41,522
Total recovery	56,757	11,819	2,351	1,295	433	474	73,129

TABLE 3.—Secondary platinum-group metals recovered in the United States, 1941–45 (average) and 1946–50, in troy ounces

	Platinum	Palladium	Iridium	Others	Total
1941–45 (average)	61,434	23,063	1,352	3,207	89,056
1946	40,385	27,856	2,002	2,394	72,637
1947	54,190	27,492	2,089	3,317	87,088
1948	58,527	28,418	2,214	4,742	93,901
1949	41,734	37,209	1,101	3,403	83,447
1950	33,894	21,167	1,064	1,988	58,113

CONSUMPTION AND USES

As pure metals, combined, clad, or alloyed with other metals, the platinum-group metals are used for jewelry, in the chemical and and electrical industries, in dentistry, and for many miscellaneous purposes. Uses of the platinum-group metals are tabulated on page 801 of the Platinum and Allied Metals chapter in Minerals Yearbook, 1943. Total sales of platinum-group metals to domestic consumers in 1950 were 495,945 troy ounces, an increase of 207,322 ounces over those in 1949 and the largest since 1945.

Sales of platinum to domestic consumers in 1950 were 308,998 ounces, a gain of 156,340 ounces over 1949 and the largest since 1945; they comprised 62 percent of the total sales of platinum-group metals in 1950 compared with 53 percent in 1949. As is normal, the jewelry trade provided the largest market, taking 41 percent of the sales to domestic consumers. By percent, sales to jewelers were considerably less than in 1949, however, owing to a large decrease in the fourth quarter. The chemical and electrical industries accounted for 37 and 15 percent, respectively, of the domestic consumption of platinum in 1950, with most of the activity in the third and fourth quarters. Noteworthy was the large extension in the use of platinum as a catalyst for producing high-octane gasoline from low-grade and natural gasoline.[1] Sales for dental and medical and miscellaneous uses in 1950 were about double those of 1949. Platinum was imported by the Government for the National Strategic Stockpile, but this metal is not included in the figures on consumption.

Sales of palladium to domestic consumers in 1950 were 150,456 ounces, an increase of 34,221 ounces over sales in 1949. The electrical industry continued to be the largest market, taking 53 percent. Sales for jewelry and decorative uses [2] and dental and medical uses in 1950 were at nearly the same levels as in 1949, but sales to the chemical industry were at an all-time high.

Sales of iridium, osmium, rhodium, and ruthenium together comprised 7 percent of total sales of platinum-group metals in 1950; by quantity, the sales totaled 36,491 ounces, a gain of 16,761 ounces over 1949. The use of osmium for hydroxilation purposes in chemical processing has increased.

[1] Bland, William F., Platforming: Petrol. Processing, vol. 5, No. 4, April 1950, pp. 351-355.
Haensel, Vladimir, Platforming: Petrol. Processing, vol. 5, No. 4, April 1950, pp. 356-360.
Haensel, Vladimir, and Berger, Charles V., Aromatics by Platforming: Petrol. Processing, vol. 6, No. 3, March 1951, pp. 264-267.

[2] A pamphlet, The Working and Handling of Jewelry Palladium, has been published by Baker & Co., Inc., Newark, N. J.

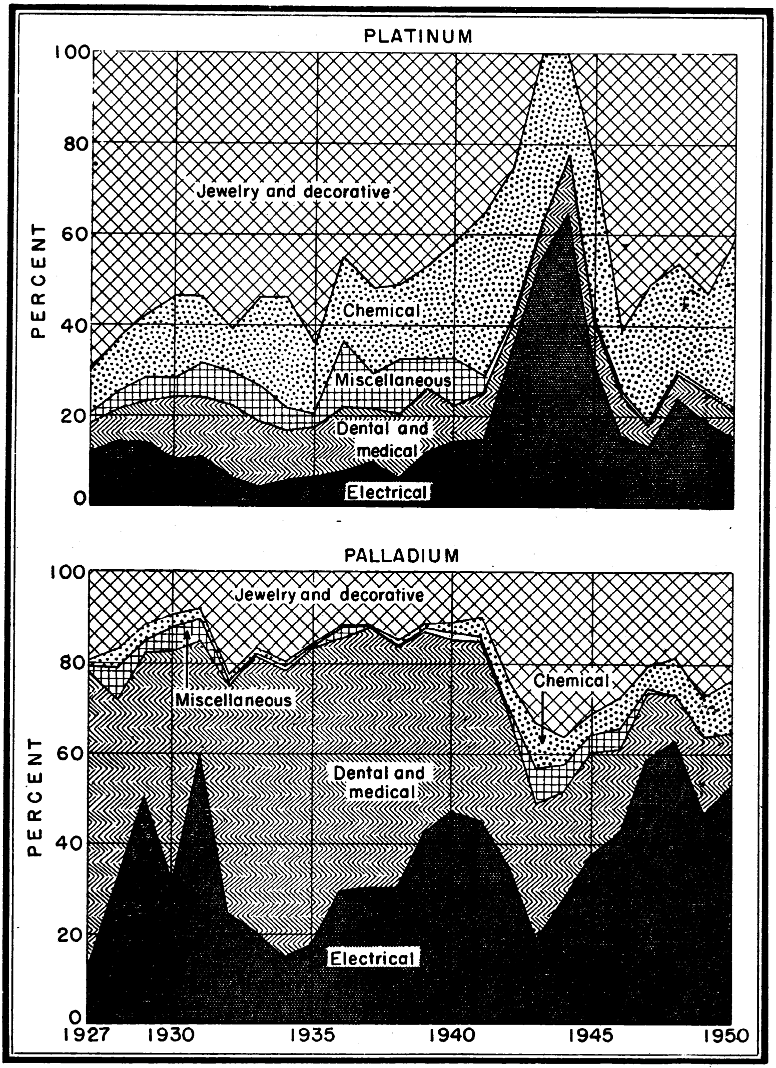

FIGURE 2.—Sales of platinum and palladium to various consuming industries in the United States, 1927–50, as percent of total.

TABLE 4.—Platinum-group metals sold to consuming industries in the United States in 1949 and 1950, in troy ounces

Industry	Platinum	Palladium	Iridium, osmium, rhodium, and ruthenium	Total
1949				
Chemical	32,179	9,580	4,454	46,213
Electrical	28,699	54,275	2,124	85,098
Dental and medical	9,505	19,901	121	29,527
Jewelry and decorative	80,426	32,060	10,792	123,278
Miscellaneous and undistributed	1,849	419	2,239	4,507
Total	152,658	116,235	19,730	288,623
1950				
Chemical	114,430	16,673	13,875	144,978
Electrical	45,229	80,024	3,316	128,569
Dental and medical	18,182	18,359	371	36,912
Jewelry and decorative	127,374	35,293	12,810	175,477
Miscellaneous and undistributed	3,783	107	6,119	10,009
Total	308,998	150,456	36,491	495,945

STOCKS

Stocks of platinum-group metals in all forms in the hands of refiners, dealers, and importers totaled 266,562 troy ounces on December 31, 1950, compared with 296,044 ounces on December 31, 1949, a decrease of 10 percent.

TABLE 5.—Stocks of platinum-group metals held by refiners, importers, and dealers in the United States, December 31, 1946–50, in troy ounces

Year	Platinum	Palladium	Iridium, osmium, rhodium, and ruthenium	Total
1946	187,624	132,523	41,876	362,023
1947	133,300	167,364	36,859	337,523
1948	146,823	142,211	34,540	323,574
1949	138,049	122,408	35,587	296,044
1950	125,234	107,854	33,474	266,562

PRICES

The quoted retail price of refined platinum was lowered $3 an ounce on February 1 to $69, where it remained until the third quarter, when several increases resulted in a price of $103 on September 11; it was reduced to $93 on October 18 and remained unchanged during the balance of the year. The quotation for iridium was $100–$105 an ounce to February 9, then $100 to July 10, when it was raised to $160.

Two further increases placed it at $220 on September 7, but it was reduced to $200 on October 18. The nominal quotation of $100 an ounce for osmium was increased to $150 on July 20, then to $200–$215 on September 11. The price of ruthenium was lowered $3 an ounce to $69 on June 8; revised upward three times in the third quarter, reaching $103 on September 11; then reduced to $93 on October 18. The quotations for palladium and rhodium were $24 and $125 an ounce, respectively, throughout 1950.

Buyers reported purchases at $50 to $110.22 an ounce for domestic and foreign crude platinum-group metals in 1950. This price range results chiefly from variations in the iridium content of crudes and fluctuations in quotations for refined metals.

FOREIGN TRADE [3]

Imports.—Imports of platinum-group metals into the United States in 1950 were 96 percent greater than in 1949 and were an all-time high. The principal sources were Canada (192,906 ounces), United Kingdom (97,825 ounces), Soviet Union (45,896 ounces), Colombia (35,605 ounces), Union of South Africa (27,202 ounces), Netherlands (9,344 ounces), Switzerland (8,053 ounces), and Norway (3,149 ounces). Imports of refined metals in 1950 totaled 379,188 troy ounces compared with 184,536 ounces in 1949; corresponding figures for unrefined materials are 48,446 and 33,748 ounces. Imports of refined platinum, palladium, iridium, osmium, rhodium, and ruthenium were up 114, 100, 61, 590, 73, and 86 percent, respectively.

Platinum was imported from the United Kingdom by the United States Government for the National Stockpile. Also of special interest was the importation of 1,469 ounces of platinum and 44,427 ounces of palladium from the Soviet Union—the first receipts from this source after a considerable interval.

TABLE 6.—Platinum-group metals imported for consumption in the United States, 1941–45 (average) and 1946–50

[U. S. Department of Commerce]

Year	Troy ounces	Value	Year	Troy ounces	Value
1941–45 (average)	345,424	$10,330,623	1948	272,733	$14,973,356
1946	[1] 413,695	[1] 14,652,686	1949	218,284	[1] 11,855,150
1947	308,865	[1] 11,792,126	1950	427,634	23,211,978

[1] Revised figure.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 7.—Platinum-group metals (unmanufactured) imported for consumption in the United States, 1949–50, by countries, in troy ounces [1]

[U. S. Department of Commerce]

Country	Unrefined materials [2]				Refined metals					Total
	Ores and concentrates of platinum metals	Platinum grain and nuggets (including crude, dust, and residues)	Platinum sponge and scrap	Osmiridium	Platinum	Palladium	Iridium	Osmium	Rhodium and ruthenium	
1949										
Belgium-Luxembourg			6		1,948	3,345	155		895	6,349
Canada	345		593		66,583	53,761	2,101		7,020	130,403
China			775		725					1,500
Colombia	160	25,804	216		155					26,335
Egypt		359								359
Finland					(3)	127				[4] 127
France					2,178					2,178
Germany			33				800			833
Hong Kong					675					675
Israel-Jordan						396	25		50	471
Lebanon					3,710	225				3,935
Netherlands				[4] 1,248				25	84	[4] 1,357
Norway					575	390	105		280	1,350
Panama		653	28							681
Switzerland		644	49		4,272	[4] 8,510	[4] 346	[4] 30	947	[4] 14,798
Union of South Africa			2	[4] 1,389		[4] 210	[4] 15	[4] 15		[4] 1,631
United Kingdom		100	1,046		[4] 14,249	6,799	[4] 674	[4] 150	1,979	[4] 24,997
Other countries		43	255			7				305
Total	505	27,603	3,003	2,637	95,070	73,770	4,221	220	11,255	218,284
1950										
Belgium-Luxembourg					455					455
Canada	204	(5)	1,389		108,958	63,021	4,701		14,633	192,906
China			1,342		288					1,630
Colombia		35,605								35,605
Egypt					1,370					1,370
France			125		435		100			660
Germany					13	217	100	318		648
Hong Kong			200		283					483
Japan			104		345				34	483
Lebanon					708					708
Netherlands					760	8,270	204		110	9,344
Norway					1,694	750	165		540	3,149
Panama					72					72
Switzerland			513		4,966	2,028	197	64	285	8,053
Taiwan (Formosa)					482					482
Union of South Africa			5,005	1,231	11,527	5,539	500	700	2,700	27,202
U. S. S. R					1,469	44,427				45,896
United Kingdom		188	11	2,011	69,959	22,854	835	435	1,532	97,825
Venezuela	360					48			72	480
Other countries	64		94		6	19			(5)	183
Total	628	35,793	8,783	3,242	203,790	147,173	6,802	1,517	19,906	427,634

[1] On the basis of detailed information received by the Bureau of Mines from importers, certain items recorded by the U. S. Department of Commerce as "grain and nuggets," and "sponge and scrap" have been reclassified and included with other groups in this table.
[2] U. S. Department of Commerce categories are in terms of metal content. It is believed, however, that in many instances, gross weights are actually reported.
[3] Revised to none.
[4] Revised figure.
[5] Less than 0.5 troy ounce.

TABLE 8.—Platinum-group metals (unmanufactured) imported for consumption in the United States, 1949–50 [1]

[U. S. Department of Commerce]

Material	1949		1950	
	Troy ounces	Value	Troy ounces	Value
Unrefined materials: [2]				
Ores and concentrates of platinum metals	505	$17,977	628	$26,306
Platinum grain and nuggets (including crude, dust, and residues)	27,603	1,495,446	35,793	2,071,135
Platinum sponge and scrap	3,003	202,957	8,783	564,161
Osmiridium	2,637	231,392	3,242	259,377
Total	33,748	1,947,772	48,446	2,920,979
Refined metals:				
Platinum	95,070	[3] 6,836,917	203,790	14,462,984
Palladium	73,770	1,592,561	147,173	2,971,191
Iridium	4,221	367,968	6,802	760,797
Osmium	220	27,057	1,517	253,028
Rhodium	7,615	872,839	13,152	1,404,877
Ruthenium	3,640	210,036	6,754	438,122
Total	184,536	[3] 9,907,378	379,188	20,290,999
Grand total	218,284	[3] 11,855,150	427,634	23,211,978

[1] On the basis of detailed information received by the Bureau of Mines from importers, certain items recorded by the U. S. Department of Commerce as "grain and nuggets," and "sponge and scrap" have been reclassified and included with other groups in this table.
[2] U. S. Department of Commerce categories are in terms of metal content. It is believed, however, that in many instances, gross weights are actually reported.
[3] Revised figure.

Exports.—Exports of refined platinum (including scrap) decreased to 12,753 ounces in 1950 (18,150 ounces in 1949), and exports of other platinum-group metals (including scrap) increased to 24,946 ounces (22,628 ounces in 1949). The chief foreign markets in 1950 for platinum were Germany (6,010 ounces), France (2,918 ounces), Mexico (1,147 ounces), and Cuba (668 ounces). For the other platinum-group metals Germany was the chief market, taking 18,763 ounces.

TABLE 9.—Platinum-group metals exported from the United States, 1946–50 [1]

[U. S. Department of Commerce]

Year	Ore and concentrates		Platinum (bars, ingots, sheets, wire, sponge, and other forms, including scrap)		Palladium, rhodium, iridium, osmiridium, ruthenium and osmium (metal and alloys, including scrap)		Platinum-group manufactures, except jewelry	
	Troy ounces	Value	Troy ounces	Value	Troy ounces	Value	Troy ounces	Value
1946	134	$10,377	15,468	$965,406	4,294	$196,808	6,669	$256,382
1947	42	1,322	17,766	977,468	7,783	256,150	6,327	335,797
1948	5	500	15,471	1,198,994	20,994	495,660	4,874	219,405
1949	165	1,985	18,150	1,379,976	22,628	745,349	20,702	452,824
1950	82	265	12,753	994,362	24,946	802,970	12,640	521,575

[1] Quantities are gross weight.

TABLE 10.—Platinum-group metals exported from the United States, 1949–50, by countries [1]

[U. S. Department of Commerce]

Country	Platinum (bars, ingots, sheets, wire, sponge, and other forms, including scrap)		Palladium, rhodium, iridium, osmiridium, ruthenium and osmium (metal and alloys, including scrap)		Platinum-group manufactures, except jewelry	
	Troy ounces	Value	Troy ounces	Value	Troy ounces	Value
1949						
Austria	386	$28,564	20	$430	25	$3,265
Belgium-Luxembourg	78	6,860	96	2,170	48	1,008
Canada	983	84,037	286	24,058	19,064	385,326
China	3	118	23	1,742	131	1,780
Colombia			101	2,665	24	1,171
Cuba	904	61,269	247	5,871	50	2,787
France	6,843	472,932	340	9,489		
Germany	6,260	547,665	20,136	634,100		
Greece					90	4,729
Italy	109	8,426	86	10,255	31	1,582
Japan					708	16,745
Mexico	541	37,142	221	8,213	41	1,131
Netherlands	620	41,166	53	6,316	48	2,040
Spain			193	4,819		
Switzerland	335	22,213	102	5,166		
Tangier	64	4,656	257	6,787		
United Kingdom	642	40,980	60	3,450	25	3,100
Uruguay	221	13,344				
Venezuela	17	1,329	173	4,856	33	2,103
Other countries	144	9,275	234	14,962	384	26,057
Total	18,150	1,379,976	22,628	745,349	20,702	452,824
1950						
Argentina			539	11,860		
Austria	341	30,100	638	14,000		
Belgium-Luxembourg			838	18,971	1	117
Brazil	193	15,615	6	1,647	89	7,759
Canada	402	35,245	227	26,589	11,862	478,537
Chile	20	2,098	91	6,178	21	1,730
Colombia	1	141	231	5,976	20	1,920
Cuba	668	40,991	120	2,829	13	849
Denmark	160	12,860				
France	2,918	263,140	32	6,352	79	3,477
Germany	6,010	433,269	18,763	585,020		
Hong Kong	130	5,524	198	13,881	2	146
Italy	64	4,210	272	14,762	12	278
Mexico	1,147	93,780	394	10,560	48	3,685
Philippines	17	1,183	30	853	56	1,880
Spain			456	11,383		
Switzerland	424	36,619	1,643	48,173	16	125
United Kingdom	2	100	204	17,619		
Venezuela	124	9,254	157	3,742	23	930
Other countries	132	10,233	107	2,575	398	20,142
Total	12,753	994,362	24,946	802,970	12,640	521,575

[1] Quantities are gross weight.

WORLD REVIEW

Canada.—According to the Dominion Bureau of Statistics, the output of byproduct platinum-group metals from the nickel-copper ores of the Sudbury district, plus a small quantity from placers in British Columbia, amounted to 121,100 troy ounces of platinum and 148,342 ounces of other platinum-group metals in 1950 compared with 153,784 ounces of platinum and 182,233 ounces of other platinum-group metals in 1949.

Sales of platinum-group metals by The International Nickel Co. of Canada, Ltd., were 267,316 ounces in 1950 compared with 214,735 ounces in 1949. Some increase in production of byproduct platinum-group metals is expected to result from the 5-percent increase in refined-nickel production announced during July 1951.

Colombia.—The South American Gold & Platinum Co. produced 25,968 ounces of crude platinum-group metals in 1950 compared with 20,213 ounces in 1949. The crude material contains about 85 percent platinum-group metals.

TABLE 11.—World production of platinum-group metals, 1941–45 (average) and 1946–50, in troy ounces

[Compiled by Berenice B. Mitchell]

	1941–45 [1] (average)	1946	1947	1948	1949	1950
Australia:						
New South Wales: Placer platinum	6					
Tasmania: Placer osmiridium	131	95	99	92	39	46
Belgian Congo: Palladium from refineries				209	106	
Canada:						
Platinum: Placer and from refining nickel-copper matte	[2] 199,000	121,771	94,570	121,404	153,784	121,100
Other platinum-group metals: From refining nickel-copper matte	[2] 189,522	117,566	110,332	148,343	182,233	148,342
Colombia: Placer platinum	36,815	43,835	41,415	40,047	20,797	26,445
Ethiopia: Placer platinum	788	[3] 140	[3] 1,548	[3] 460	[3] 355	(4)
Indonesia: Placer platinum	6					
Italy: Platinum from refineries	264					(4)
New Zealand: Placer platinum	12	14				
Papua: Placer platinum [5]	1				(4)	(4)
Sierra Leone: Placer platinum	4	105	431	109	38	(4)
Union of South Africa:						
Platinum-group metals from platinum ores	75,277	21,877	23,332	22,549	30,500	144,217
Concentrates (platinum-group metal content) from platinum ores		50,575	55,508	46,374	56,800	
Osmiridium from gold ores	6,661	6,100	6,071	5,520	6,031	6,449
U. S. S. R.: Placer platinum and from refining nickel-copper ores (estimate)	125,000	175,000	150,000	125,000	100,000	100,000
United States: Placer platinum and from domestic gold and copper refining	34,984	26,312	18,406	19,253	24,807	37,855
Total (estimate)	[2] 675,000	575,000	500,000	525,000	575,000	575,000

[1] The production data have been revised since publication in the Minerals Yearbook as follows: 1941, Indonesia 33 troy ounces, Italy 868, Sierra Leone 5; 1942, Canada 285,218 (platinum), Colombia 43,103; 1943, Canada 219,706 (platinum), Colombia 34,564; 1944, Colombia 34,304.
[2] Includes certain adjustments in 1945, to account for metals produced in Canada in 1938–44 but not included in the statistics for those years.
[3] Exports for year ended Sept. 10 of year stated.
[4] Data not available; estimate included in total.
[5] Year ended June 30 of year stated.

Southern Rhodesia.—Large, low-grade, platinum-bearing deposits similar to those mined in the Union of South Africa are known in Southern Rhodesia. An unsuccessful attempt was made to work these deposits in the Bulawayo district in the late 1920's. A recent report from Bulawayo indicates that a new way has been found for treating the ore, and a company has been formed to sample the deposits over a large area. A pilot plant may be installed if the sampling results are favorable.[4]

Union of South Africa.—According to the Department of Mines, 2,078 tons of matte, averaging 42.81 ounces per ton of platinum-group metals, and 256,385 ounces of crude metallics, averaging 21.55 percent platinum-group metals, were produced in South Africa in 1950 compared with 1,329 tons of matte and 120,020 ounces of crude metallics

[4] The Financial Times (London), Platinum in S. Rhodesia: No. 19,230, Jan. 3, 1951, p. 6.

in 1949. These figures correspond to an output of about 144,200 ounces of platinum-group metals in 1950 (about 87,300 ounces in 1949). The production of osmiridium in 1950 was 6,449 ounces compared with 6,031 ounces in 1949.

Sales of platinum-group metals and gold from the Rustenburg district were 105,750 ounces in 1950 compared with 94,092 ounces in 1949. The proportions of the various metals of the platinum group and gold sold in 1949 were as follows:

Metal:	*Percent*
Platinum	61. 27
Palladium	29. 21
Iridium	. 30
Osmium and Osmiridium	. 10
Rhodium	1. 80
Ruthenium	3. 32
Gold	4. 00
Total	100. 00

Sales of osmiridium were 5,891 ounces in 1950 compared with 6,471 ounces in 1949. That sold in 1949 had the following average composition:

Metal:	*Percent*
Osmium	28. 02
Iridium	24. 86
Ruthenium	12. 58
Platinum	11. 28
Gold	3. 03
Rhodium	. 71
Balance (undetermined)	19. 52
Total	100. 00

The following is excerpted from an unpublished report on Platinum in Africa prepared by J. M. Warde, African Division, Foreign Minerals Region of the Bureau of Mines (December 1950):

* * * The bulk of the Union output comes from platinum ore occurring in the Merensky Reef, a horizon of the Bushveld complex in the Transvaal. The Merensky Reef constitutes one of the largest reserves of platinum in the world. It has been located at intervals over a distance of about 100 miles in the Brits and Rustenburg districts and some 40 miles in the Potgietersrust district. Average values of platinum metals in the Merensky Reef in the Lydenburg district are low, only about .10 ounces per ton over a large area tested. In the Rustenburg area, it ranges between .25 and .35 ounces per ton over stoping widths of about 30 inches through stretches measuring 5,000 to 18,000 feet along the strike and several hundred feet along the dip. The Rustenburg Platinum Mines Ltd., under the aegis of the Johannesburg Consolidated Investment Corporation Ltd., is the only company now engaged in mining the Merensky Reef. This Company absorbed a number of former producers and in 1949 expanded its mining and milling facilities and acquired the assets of the Union Platinum Mines Ltd. Combined milling capacity now controlled by the Rustenburg Platinum Mines Ltd., totals 70,000 tons of ore per month. * * * The platinum metals are recovered at the Company's reduction works by a combination of gravity concentration and flotation. By the former, a marketable concentrate of crude metallics averaging about 22 percent platinum-group metals is produced. The flotation concentrate consists of platiniferous sulphides of copper, nickel and iron, and gangue. This is smelted and the nickel-copper matte, which contains about 43 ounces per ton of platinum-group metals, is the product shipped.

The remainder of the production of the Union is osmiridium, a byproduct of gold mining in the Witwatersrand and extensions. The Union has for many years been the leading producer of osmiridium which occurs in minute quantities in the Witwatersrand conglomerates. Together with gold, the mineral is retained on corduroy tables during milling operations. The gold is removed by amalgamation and the osmiridium is further concentrated on shaking tables. An area in the center of the Far East Rand produces from .3 to 1.0 ounce of osmiridium per 1,000 tons of ore milled. Production from adjacent mines is much smaller. From 6 mines west of Boksburg the production varies from .10 to .25 ounce per 1,000 tons of ore crushed. During the past 15 years the osmiridium output from the Union has ranged between 5,000 and 7,000 ounces per annum The composition of the osmiridium is variable. It contains a number of platinum-group metals and gold which occur within the limits given below:

Metal:	*Range (percent)*
Osmium	44. 60–24. 13
Iridium	40. 55–21. 33
Ruthenium	16. 83– 8. 73
Platinum	18. 99– 3. 89
Gold	14. 94– 0. 05
Rhodium	1. 04– 0. 34

Other potential sources of platinum metals in the Union are dunite pipes in the Lydenburg district, contact metasomatic deposits of the Potgietersrust district, lode deposits of the Waterburg district, and alluvial and eluvial deposits in the platinum bearing areas described. Platinum has also been reported from many other localities of which Insizwa in Pondoland and Vlakfontein in the Rustenburg district are of interest in that the platinum is associated in minute quantities with copper and nickel bearing sulphides. * * *

The crude products obtained in the Rustenburg district are exported to England for treatment. The following account of treatment methods is excerpted from an article in The Mining Journal.[5]

Extensions at Brimsdown to Handle Rustenburg Ores

The Rustenburg platinum metals are shipped from the Union to London as a matte and are recovered here. In order to deal with the increasing scale of output from the Rustenburg Mines—to which have now to be added that of the Union Platinum property—very considerable additions to the treatment plant have been recently completed at the Brimsdown works of Johnson, Matthey and Co., Limited. * * *

* * *

Treatment at Brimsdown

The matte is smelted with salt cake. This is known as the "top and bottom" process, in which sodium copper sulphide constitutes the top and nickel sulphide the bottom. The copper sulphide "tops" are melted in a reverberatory and from thence are passed to a copper converter where they are blown to blister copper and cast into anodes for electro refining. The nickel sulphide "bottoms" are ground and roasted in rotary-hearth furnaces to nickel oxide. This is then briquetted with coal, reduced to metallic nickel in a reverberatory and cast into anodes, which are refined electrolytically.

The adherent slime containing the platinum metals, with a fairly large proportion of nickel, is removed from the anode, roasted and treated with sulphuric acid for the extraction of base metals. The residue containing the platinum metals, copper, nickel and lead, is treated for complete elimination of base metals, and the platinum metals brought into solution for their separation and individual purification.

Thus the principal features of the foregoing treatment are designed to effect a complete recovery of the platinum metals and at the same time yield electrolytically refined copper and nickel. * * *

[5] Mining Journal (London), Treatment of Rustenburg Platiniferous Ores: Vol. 235, No. 6014, Nov. 24, 1950, p. 511.

Potash

By Bertrand L. Johnson and Nan C. Jensen

GENERAL SUMMARY

THE long-term upward trends in the production and sales of domestic marketable potassium salts, which had been interrupted in 1949 by the New Mexico strike, were resumed in 1950. Both production and sales reached record highs (see fig. 1). Exports declined in both quantity and value from 1949, but imports increased greatly in both categories. Apparent domestic consumption of potash (K_2O) in 1950 increased 339,629 tons from the 1949 figure, but stocks in producers' hands at the end of 1950 were larger than in other recent years.

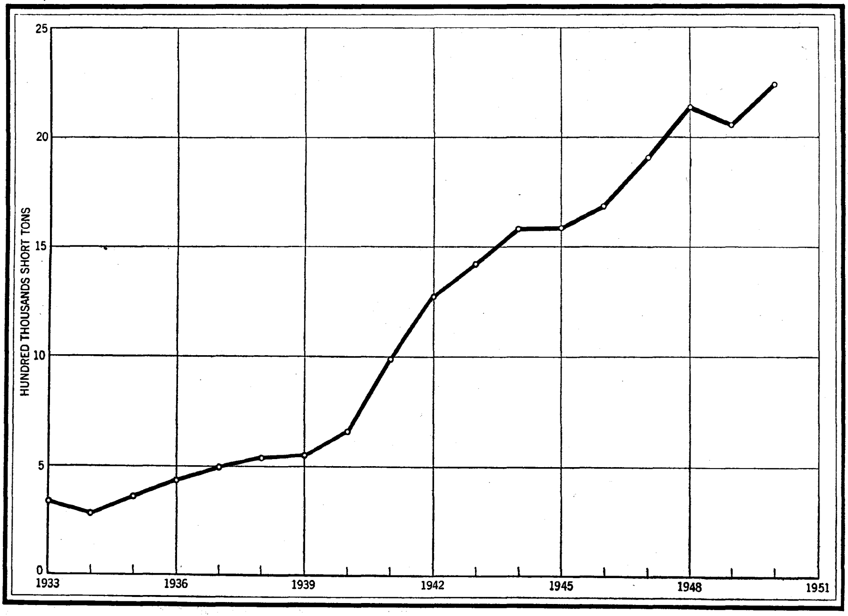

FIGURE 1.—Production of marketable potassium salts in the United States, 1933–50.

TABLE 1.—Salient statistics of the potash industry in the United States, 1948–50

	1948	1949	1950
Production of potassium salts (marketable) short tons	2,138,493	2,056,609	2,241,044
Approximate equivalent K_2O do	1,139,881	1,118,395	1,286,762
Sales of potassium salts by producers do	2,148,807	2,062,789	2,220,803
Approximate equivalent K_2O do	1,143,339	1,120,653	1,275,494
Value at plant	$35,998,758	$35,105,799	$39,695,038
Average per ton	$16.75	$17.02	$17.87
Imports of potash materials short tons	52,890	43,719	379,654
Approximate equivalent K_2O do	27,181	19,216	199,493
Value	$3,063,547	$2,358,557	$13,994,969
Exports of potash materials short tons	128,068	[1] 126,757	117,137
Approximate equivalent K_2O [2] do	69,733	[1] 69,558	65,047
Value	$8,288,955	[1] $7,110,835	$5,534,271
Apparent consumption of potassium salts [3] short tons	2,073,629	[1] 1,979,751	2,483,320
Approximate equivalent K_2O do	1,100,787	[1] 1,070,311	1,409,940

[1] Revised figure.
[2] Estimate by Bureau of Mines.
[3] Quantity sold by producers, plus imports, minus exports.

Articles were published on the domestic potash industry and on potash reserves.[1]

PRODUCTION AND SALES

In spite of the strike in the New Mexico potash field, which, starting in November 1949, had continued through January 1950, the upward trend in the annual production and sales of domestic marketable potassium salts, which had been in evidence from 1934 to 1948, was resumed in 1950. Total domestic output of potassium salts reached a record high of 2,241,044 short tons, with an equivalent K_2O content of 1,286,762 tons. Sales in 1950 were 2,220,803 tons, with an equivalent K_2O content of 1,275,494 tons; both likewise were records. The value of sales rose to $39,695,038, also a new high. The average value per ton of potassium salts sold increased from $17.02 in 1949 to $17.87 in 1950.

Production of the 60–62 percent K_2O minimum grade of muriate of potash increased markedly in 1950 over 1949, rising to a record high, but there was a notable decrease in the output of lower-grade muriate. The production of manure salts dropped very sharply—from 177,315 tons in 1949 to only 21,532 tons in 1950. The combined output of sulfate of potash and sulfate of potash-magnesia reversed its recent trend and rose in 1950 to a new high of 223,109 tons (see fig. 2).

The Western States remain dominant in domestic production of potash. California, New Mexico, and Utah furnished virtually all of the 1950 output, the largest part coming from the deeply buried Permian sylvite and langbeinite deposits in the Carlsbad region of southeastern New Mexico. The eastern United States supplied only a small quantity—from Maryland and Michigan.

[1] Smith, H. I., Potash: Am. Inst. Min. and Met. Eng., Industrial Minerals and Rocks, 2d ed., New York, 1949, pp. 684–713.
Turrentine, J. W., U. S. Reserves of Potash Estimated on Sound Basis: Eng. and Min. Jour., vol. 151, No. 8, August 1950, pp. 94–95.

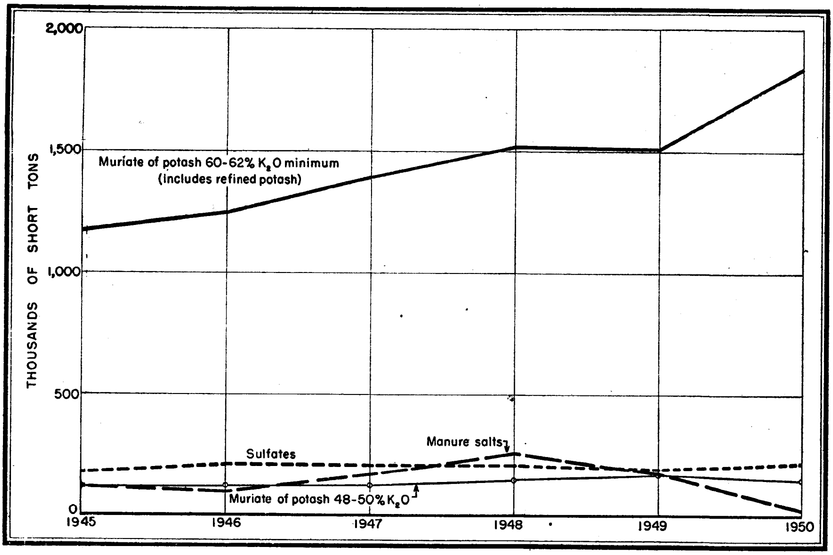

FIGURE 2.—Potassium salts produced in the United States, 1945–50, by grades, in short tons.

TABLE 2.—Potassium salts produced in the United States, 1948–50, by grades, in short tons

Grade	1948	1949	1950
Muriate of potash:			
60–62 percent K_2O minimum [1]	1,523,937	1,513,128	1,844,856
48–50 percent K_2O minimum	145,675	172,475	151,547
Manure salts	260,339	177,315	21,532
Sulfate of potash and sulfate of potash-magnesia	208,542	193,691	223,109
Total	2,138,493	2,056,609	2,241,044

[1] Includes refined potash and some 93–96 percent KCl.

TABLE 3.—Potassium salts produced, sold, and in producers' stocks in the United States, 1946–50

Year	Production			Sales				Producers' stocks, Dec. 31	
	Operators	Potassium salts (short tons)	Equivalent potash (K_2O) (short tons)	Operators	Potassium salts (short tons)	Equivalent potash (K_2O) (short tons)	Value f. o. b. plant	Potassium salts (short tons)	Equivalent potash (K_2O) (short tons)
1946	7	1,687,735	931,812	7	1,673,249	928,374	$32,175,716	82,554	37,999
1947	7	1,905,776	1,029,875	7	1,953,307	1,053,266	34,716,051	35,428	14,697
1948	7	2,138,493	1,139,881	7	2,148,807	1,143,339	35,998,758	25,093	11,211
1949	8	2,056,609	1,118,395	8	2,062,789	1,120,653	35,105,799	18,913	9,066
1950	7	2,241,044	1,286,762	7	2,220,803	1,275,494	39,695,038	39,154	20,328

The potash-producing companies in the United States in 1950, by States, were as follows:

California:
- The American Potash & Chemical Corp., 3030 West Sixth Street, Los Angeles 54, Calif. (plant at Trona, on Searles Lake, Calif.).

Maryland:
- North American Cement Corp., 41 East Forty-second Street, New York 17, N. Y. (plant at Security, Md.).

Michigan:
- The Dow Chemical Co., Midland, Mich. (brine wells and plant near Midland, Mich.).

New Mexico:
- International Minerals & Chemical Corp., 20 North Wacker Drive, Chicago, Ill. (mine and plant near Carlsbad, N. Mex.).
- Potash Company of America, Carlsbad, N. Mex. (mine and plant near Carlsbad, N. Mex.).
- United States Potash Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y. (mine and plant near Carlsbad, N. Mex.).

Utah:
- Bonneville, Ltd., 540 West Seventh South, Salt Lake City 4, Utah (plant near Wendover, Utah).

REVIEW BY STATES

California.—The American Potash and Chemical Corp. continues to be the only potash-producing company operating in the Pacific Coast States. A potash-bearing brine is pumped from the saturated crystalline salt mass of Searles Lake in southeastern California. Potassium chloride and potassium sulfate are marketed. Two papers descriptive of the Searles Lake operations have been recently published.[2]

Maryland.—Maryland has but one producing potash company, the North American Cement Co., Security, Washington County, near Hagerstown. At this plant byproduct potash was recovered in 1950 from cement-kiln flue dust. The product—an impure sulfate of potash of low potash content—was sold for agricultural use. This operation continues to be the only one of its kind reported in the United States.

Michigan.—The Dow Chemical Co. was the only potash-producing company in Michigan in 1950. Potassium chloride was produced from its natural brine wells at Midland, Mich.

New Mexico.—Mine production of potassium-bearing salts in the Carlsbad region of New Mexico increased 20 percent (nearly a million tons) over 1949, surpassing the previous high of 1948. The equivalent K_2O content of the mined salts decreased slightly, however, from 21.00 percent in 1949 to 20.65 percent in 1950. The quantity of merchantable potash salts produced in 1950 also increased over 1949, as did quantity and value of sales.

All three of the producing companies—International Minerals & Chemical Corp., Potash Company of America, and United States Potash Co.—mined sylvite (potassium chloride), and one—International Minerals & Chemical Corp.—also mined langbeinite (a potassium-magnesium sulfate). The greater part of the mine production of the region was sylvite ore (sylvinite), most of which was processed

[2] Dyer, B. W., Searles Lake Development: Colorado Sch. Mines Quart., vol. 45, No. 4B, October 1950, pp. 39–44.
Ryan, J. E., Searles Lake and Operations of the American Potash and Chemical Corporation at Trona, California: Paper presented before October 1950 meeting, Am. Inst. Min. and Met. Eng., Industrial Minerals Div., Los Angeles Section, 16 pp.

to yield 60 percent or higher-grade muriate. This was produced by all three companies. Potassium sulfate and potassium-magnesium sulfate (sulfate of potash-magnesia) were produced from langbeinite by the International Minerals & Chemical Corp. in the refinery at its mine near Carlsbad.

TABLE 4.—Production and sales of potassium salts in New Mexico, 1946–50, in short tons

Year	Crude salts [1]		Marketable potash salts				
	Mine production		Production		Sales		
	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Value
1946	4,309,649	893,126	1,428,860	782,166	1,432,565	789,473	$27,187,228
1947	4,655,732	965,583	1,625,870	866,070	1,659,266	880,605	28,035,675
1948	5,108,372	1,069,675	1,841,054	964,940	1,850,976	967,945	29,177,328
1949	4,852,903	1,018,886	1,733,739	927,621	1,744,427	932,497	27,950,111
1950	5,802,004	1,198,021	1,904,565	1,086,996	1,878,094	1,072,772	31,944,365

[1] Sylvite and langbeinite.

The strike called on November 19, 1949, by the CIO Mine, Mill, and Smelter Workers' Union Local 415 at the three potash-producing plants of the Carlsbad region ended January 31, 1950, after 73 days.

Several papers were published on developments in the potash industry of New Mexico.[3]

In 1950 the International Minerals & Chemical Corp. was sinking a third shaft at its Carlsbad mine and planning to sink another early in 1951 to develop existing ore reserves. These new shaft sites were sealed from the surface before sinking by drilling a series of holes around the shafts into the known water-bearing stratum and sealing the entire area by pregrouting with concrete under pressure.

Recent improvements at the mine of the Potash Company of America have included a grinding-mill extension, a new compressor building, a new research building, and a new refinery control laboratory. Construction was begun in January 1950 on a research pilot-plant building. The new hoist at the mine is reported to be driven by two 500-hp. G-E motors which raise one 8-ton ore bucket per minute from 1,150 feet below ground. The sinking of No. 3 shaft is said to have been abandoned when it ran into heavy flows of water and running sand. No. 4 shaft, started later, is also said to have encountered quicksand, and work stopped. In July 1950, however, it is reported that a contract was awarded for completing this shaft, using a freezing method of stabilizing the quicksand.

The Potash Company of America is building a new plant at Dumas, Tex., for the production of sodium sulfate, potassium sulfate, and hydrochloric acid without the direct use of sulfuric acid. This plant is to use the Hargreaves process, or a modification of it, in which sulfur dioxide, steam, and air are blown through solid sodium chloride or

[3] Chemical Engineering, Potassium Chloride and Sulphate: Vol. 57, No. 1, January 1950, pp. 168–171. (Operations of the International Minerals & Chemical Corp.)
Harley, G. T., Potash: Eng. and Min. Jour., vol. 152, No. 2, February 1951, pp. 102–103.
Kurrelmeyer, L. H., The Potash Industry: Univ. of New Mexico, Dept. of Govt., Div. of Research, Albuquerque, N. Mex., 1951, 83 pp.
White, N. C., and Arend, C. A., Jr., Potash Production at Carlsbad: Chem. Eng. Progress, vol. 46, No. 10, October 1950, pp. 523–530.

potassium chloride to produce the sulfates and hydrochloric acid. The sulfur used will be that recovered from west Texas sour natural gas. The sodium chloride and potassium chloride will come from their Carlsbad operations. The plant was expected to be in operation by the end of 1950. The Hargreaves process was formerly used extensively, but in recent years only one plant in this country has operated the process.

The United States Potash Co. started the installation of a new steel head frame at its No. 2 shaft for auxiliary hoisting and servicing during 1950.

The Duval Texas Sulphur Co. was organized in 1926 under the laws of Texas as a direct subsidiary of the United Gas Corp. and an indirect subsidiary of the Electric Bond & Share Co. The name of the company was changed in February 1950 to Duval Sulphur & Potash Co., with main offices in the Esperson Building, Houston 2, Tex. The mail address for the potash mine is P. O. Box 510, Carlsbad, N. Mex. This company began exploring for potash on Federal and State lands in the Carlsbad region in October 1947. By November 1, 1949, the company had drilled 60 holes. Construction of two mine shafts was started early in 1950. These are to be 1,500 feet deep. The potash beds are reported to be between 1,200 and 1,500 feet below the surface. The plant that the company proposes to build is being designed to mine and mill approximately 720,000 short tons of potash ore per year. A spur track is to connect the mine with the line of the Atchison, Topeka & Santa Fe Railway. Ashcraft-Wilkinson Co., Atlanta, Ga., will be the exclusive sales agent for the muriate of potash produced.

The Southwest Potash Corp., wholly owned subsidiary of the American Metal Co., Ltd., was formed in 1948 to hold Federal and State permits on lands in the potash field of Carlsbad, N. Mex. In 1950 this corporation decided to develop the large potash deposit it had discovered in 1949 near Carlsbad, mainly on Government lands. By the end of 1950, design and engineering work on the mine and plant were well advanced. Two circular shafts, 20 and 15 feet in diameter, were being sunk, and construction of surface installations, including power line, railroad, and a 24-mile water-pipe line, had been started. Production was expected to begin in the second half of 1952. The mine and mill will be capable of handling 2,500 tons of ore daily, which will be treated by the flotation process to produce standard muriate of potash (KCl), with a minimum equivalent of 60 percent K_2O, for use as a fertilizer. The initial capacity of the plant is to be approximately 185,000 tons of K_2O per year.[4]

Pennsylvania.—The Publicker Industries, Inc., reports that in 1950 it made no recovery of byproduct potassium-sulfate-bearing material from molasses residues at its Bigler Street distillery in Philadelphia. The 1949 output was sold for use as a fertilizer ingredient.

Utah.—Commercial production of potash in Utah in 1950 was still restricted to the operations of Bonneville, Ltd. This company continued to produce potassium chloride from the potassium-bearing brines of Salduro Marsh, at its plant near Wendover, Tooele County,

---

American Metal Co., Ltd., Annual Report for the 63d year, ended Dec. 31, 1950, 44 pp.

northwestern Utah. A brief description of the operations there was published during the year.[5]

No production of alunite was reported from the Marysvale district. It is stated, however, that some of the alunite deposits in that area are being worked for uranium ores.

Uranium mineralization of probable late Tertiary age has been found to be widespread in the Marysvale alunite area, in volcanic and plutonic igneous rocks of Tertiary age. A genetic relationship between this type of mineralization and the well-known alunite occurrences has not yet been determined.[6]

CONSUMPTION

Apparent consumption of potash (K_2O) in the United States and its possessions, as determined by subtracting exports from the sum of imports and producers' sales, increased from 1,070,311 short tons in 1949 to 1,409,940 tons in 1950. The relationship of apparent consumption to sales of domestic producers, as reported to the Bureau of Mines, is shown in figure 3.

TABLE 5.—Apparent consumption [1] of potash in the United States, 1945–50, in short tons

Year	Potassium salts	Approximate equivalent K_2O	Year	Potassium salts	Approximate equivalent K_2O
1945	1,490,112	808,688	1948	2,073,629	1,100,787
1946	1,568,721	867,096	1949	[2] 1,979,751	[2] 1,070,311
1947	1,879,441	1,011,142	1950	2,483,320	1,409,940

[1] Quantity sold by producers, plus imports, minus exports.
[2] Revised figure.

According to the American Potash Institute (press notice, February 24, 1951):

Deliveries of potash in North America during 1950 reached a new record high amounting to 2,579,085 short tons of salts containing an equivalent of 1,465,599 tons K_2O. This was an increase of 319,806 tons K_2O or 28 percent over 1949. Deliveries by the five leading domestic producers were the highest ever achieved, 1,255,218 tons K_2O, in spite of a strike which greatly reduced production in the Carlsbad area in January. Imports were 210,381 tons K_2O, the highest since 1938.

Deliveries for agricultural purposes in the continental United States for 1950 were 1,264,119 tons K_2O, an increase of 291,965 tons over 1949. Canada received 54,726 tons K_2O, Cuba 11,936 tons, Puerto Rico 24,728 tons, and Hawaii 13,430 tons. Exports to other countries amounted to 16,313 tons K_2O.

In this country the potash was delivered in 46 States and the District of Columbia. Illinois and Ohio with over 100,000 tons K_2O were the leading States in deliveries of agricultural potash and were followed in order by Georgia, Virginia, Florida, Maryland, North Carolina, and Indiana, each taking more than 70,000 tons K_2O during the year. Due to shipments across State lines, consumption does not necessarily correspond to deliveries within a State.

The 60 percent muriate of potash continues to be by far the most popular material, comprising 79 percent of the total K_2O delivered for agricultural purposes. The 50 percent muriate of potash made up nearly 13 percent, manure salts less than

[5] Newsweek, Salty Harvest: Vol. 36, No. 14, Oct. 2, 1950, p. 52.
[6] Gruner, J. W., Fetzer, W. G., and Rapaport, Irving, The Uranium Deposits Near Marysvale, Piute County, Utah: Econ. Geol., vol. 46, No. 3, May 1951, pp. 243–251.

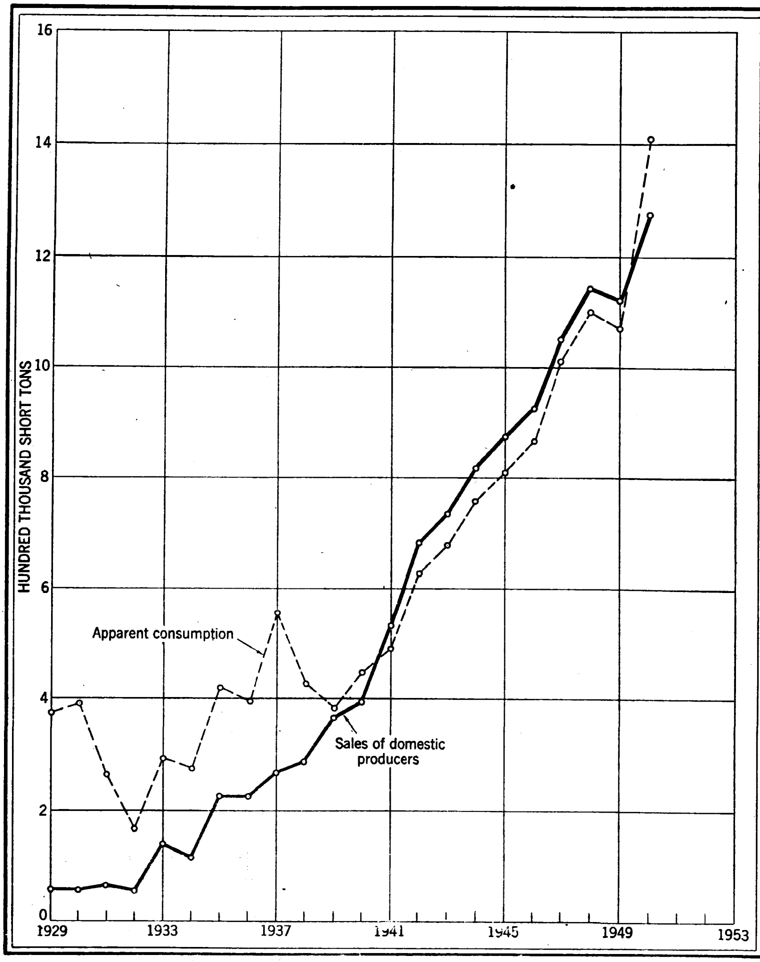

FIGURE 3.—Comparison of apparent domestic consumption of potash (K_2O) and sales of domestic producers of potash in the United States, 1929–50.

1 percent, and sulphate of potash and sulphate of magnesia 8 percent of deliveries. The increased refining capacity and the demand for potash in the more concentrated form have resulted in a marked decline in manure salts.

Deliveries for chemical purposes in 1950 were 121,330 tons of muriate of potash containing an equivalent of 76,111 tons K_2O and 8,390 tons of sulphate of potash containing 4,236 tons K_2O. The total chemical deliveries of 80,347 tons K_2O were 13,782 tons or 21 percent more than in 1949.

Deliveries of agricultural and chemical potash in North America from 1940 to 1950 are shown in the accompanying diagram (fig. 4).

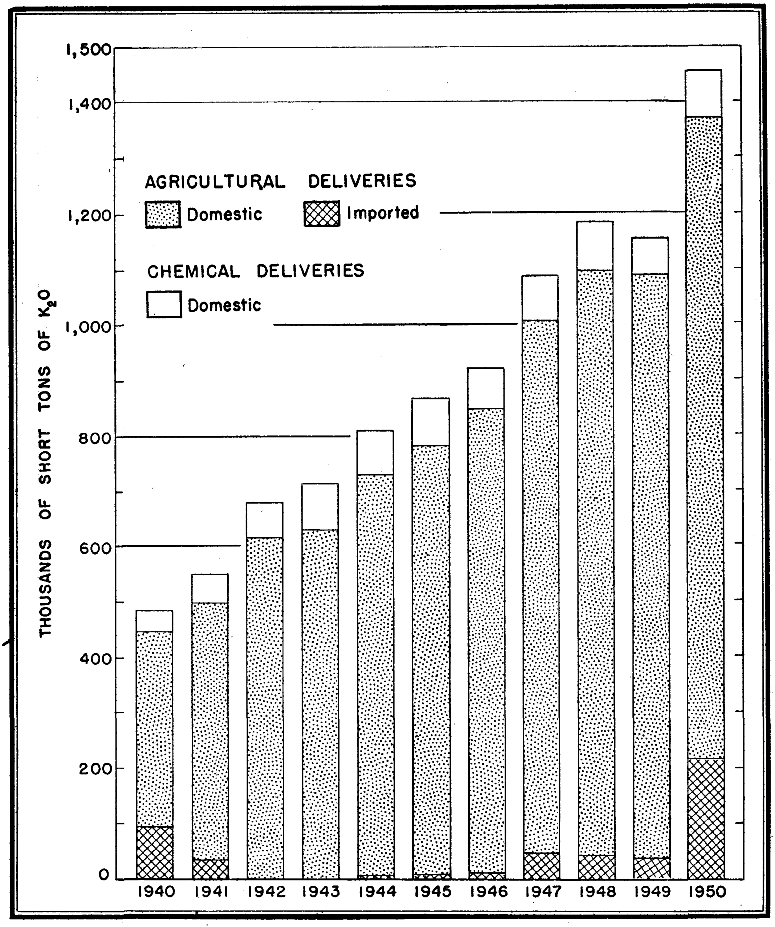

FIGURE 4.—Potash deliveries, by use groups, in North America, 1940–50 (American Potash Institute).

TABLE 6.—Deliveries of potash salts in 1950, by States of destination, in short tons of K_2O

[American Potash Institute]

State	Agricultural potash	Chemical potash	State	Agricultural potash	Chemical potash
Alabama	47,270	----------	Nebraska	709	----------
Arizona	914	----------	Nevada	31	2,139
Arkansas	28,121	----------	New Hampshire	9	25
California	18,154	3,532	New Jersey	28,811	1,971
Colorado	912	----------	New Mexico	215	----------
Connecticut	4,974	206	New York	26,736	54,373
Delaware	3,965	761	North Carolina	77,835	----------
District of Columbia	187	----------	North Dakota	1,280	----------
Florida	84,095	20	Ohio	104,857	1,773
Georgia	98,570	410	Oklahoma	1,611	270
Idaho	355	----------	Oregon	3,459	477
Illinois	114,279	1,625	Pennsylvania	22,909	900
Indiana	73,593	73	Rhode Island	282	----------
Iowa	19,240	281	South Carolina	57,453	----------
Kansas	1,370	740	Tennessee	37,449	348
Kentucky	19,171	25	Texas	15,193	3,665
Louisiana	27,728	----------	Utah	316	83
Maine	14,522	20	Vermont	461	----------
Maryland	81,578	1,035	Virginia	98,046	493
Massachusetts	13,243	106	Washington	3,539	----------
Michigan	22,290	737	West Virginia	592	3,611
Minnesota	25,944	----------	Wisconsin	34,645	----------
Mississippi	31,849	----------			
Missouri	15,202	271	Total	1,264,119	79,970
Montana	155	----------			

STOCKS

Stocks in producers' hands at the end of 1950 were larger than at the end of any of the three preceding years. The trend since 1922 is presented graphically in figure 5; precise data for 1946–50 are included in table 3.

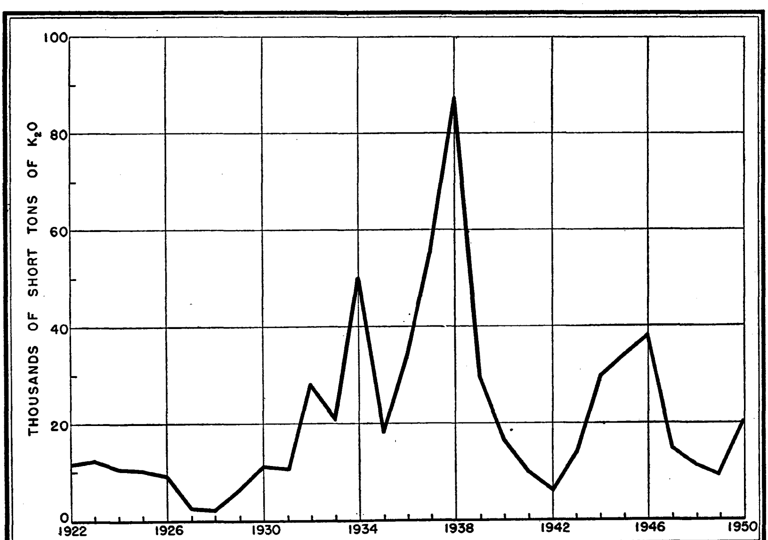

FIGURE 5.—Producers' stocks of potassium salts at end of year, 1922–50, in short tons of equivalent potash (K_2O).

PRICES

Prices for potash in the early part of 1950 were the same as those listed in the producers' price schedules for the 1949–50 season. (See Minerals Yearbook, 1949, p. 1034.)

On May 10, 1950, the American Potash & Chemical Corp. issued its price schedules for agricultural-grade Trona potash for the 1950–51 season. Its list price of muriate of potash, 60 percent K_2O minimum, f. o. b. Trona, Calif., bulk in carlots of not less than 40 tons, was quoted at 48.5 cents per unit K_2O. On October 13, 1950, the list price of the muriate was advanced 2 cents a unit to 50.5 cents per unit K_2O. The May 10, 1950, list price of sulfate of potash, 95–98 pereent K_2SO_4, was 84 cents per unit K_2O. This price was also advanced 2 cents a unit on October 13, 1950, to 86 cents per unit K_2O. The list prices of both muriate and sulfate were subject to seasonal discounts. There were additional charges for shipments in bags.

Price schedules for New Mexico potash for agricultural purposes for 1950–51 were issued in April and May 1950 by the three producing companies, as given in the following table. These prices were all higher than those for 1949–50, and they were raised again late in 1950.

TABLE 7.—Prices of agricultural potash quoted by producers, f.o.b. Carlsbad, N. Mex., for 1950–51 season[1]

Salt	Grade	Brand	Producer	Price: Period	Price: Per unit K_2O
Muriate of potash	62–63 percent K_2O	Sunshine State	U. S. P.	June 1–Oct. 19	$0.40
				Oct. 20–May 31	.42
Do	60 percent K_2O minimum, standard.	Red Muriate	P. C. A.	May 1–Sept. 27	.40
				Sept. 28–May 31	.42
Do	60 percent K_2O minimum.	International	I. M. & C.	June 1–Oct. 8	.40
				Oct. 9–May 31	.42
Do	60 percent K_2O minimum, granular.	Red Muriate	P. C. A.	May 1–Sept. 27	.415
				Sept. 28–May 31	.435
Do	50–52 percent K_2O, granular.	Sunshine State	U. S. P.	June 1–Oct. 19	.40
				Oct. 20–May 31	.42
Do.[2]	50 percent K_2O minimum.	International	I. M. & C.	June 1–Oct. 8	.40
				Oct. 9–May 31	.42
Manure salts	22 percent K_2O minimum.	Red Muriate	P. C. A.	May 1, 1950–May 31, 1951.	.21
Do	Run-of-mine 20 percent K_2O minimum.	Sunshine State	U. S. P.	June 1–May 31	.21
Sulfate of potash	90–95 percent K_2SO_4, basis 90 percent K_2SO_4.	International	I. M. & C.	June 1–Oct. 8	[3] 34.50
				Oct. 9–May 31	[3] 36.25
Sulfate of potash-magnesia.	Basis 40 percent K_2SO_4, 18.50 percent MgO.	International Sulpo-mag.	do	June 1–Oct. 8	[3] 15.20
				Oct. 9–May 31	[3] 16.00

[1] Bulk in carlots (minimum 40 tons). Subject to seasonal discounts.
[2] International Minerals & Chemical Corp. quoted muriate of potash, 50–51 percent K_2O, packed in 5-ply plain paper bags, 100 pounds each, at $23.95 per short ton June 1–Oct. 8; $25.50 Oct. 9–May 31.
[3] Per short ton.

FOREIGN TRADE [7]

Imports.—Total imports of potash salts in 1950 were very much greater than in 1949, increasing from 43,719 short tons (19,216 tons K_2O) in 1949 to 379,654 tons (199,493 tons K_2O) in 1950, owing principally to a very large increase in the arrivals of potassium-bearing fertilizer materials. The total value of imports increased markedly—

[7] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

from \$2,358,557 in 1949 to \$13,994,969 in 1950. Germany, France, Spain, and Poland-Danzig, in the order given, were the principal supplying countries in 1950. A small quantity came from Russia.

Potash for fertilizer use constituted 97 percent of the total K_2O imports in 1950, 5 percent more than in the previous year. Imports for chemical use fell from 8 percent in 1949 to 3 percent of the total in 1950.

The principal potash salt imported in 1950 for fertilizer use was muriate (chloride), which entered principally from Germany, France, Spain, and Poland-Danzig. Considerable potassium sulfate came in from Germany. Chile supplied 20,409 tons (2,857 tons K_2O) of crude sodium-potassium nitrate mixtures, considerably over the amount that entered in 1949. A much larger quantity of potassium carbonate arrived in 1950 than in 1949, principally from Germany.

TABLE 8.—Potash materials imported for consumption in the United States, 1949–50

[U. S. Department of Commerce]

Material	Approximate equivalent as potash (K_2O) (percent)	1949				1950			
		Short tons	Approximate equivalent as potash (K_2O)		Value	Short tons	Approximate equivalent as potash (K_2O)		Value
			Short tons	Percent of total			Short tons	Percent of total	
Used chiefly in fertilizers:									
Muriate (chloride)	56.4	29,126	16,427	85.5	\$1,226,863	295,922	166,900	83.8	\$9,244,446
Potassium nitrate, crude	40.0	1	(1)		43	20	9		2,465
Potassium-sodium nitrate mixtures, crude	14.0	6,802	952	4.9	310,343	20,409	2,857	1.4	882,582
Potassium sulfate, crude	50.0	631	316	1.6	34,000	44,125	22,063	11.0	1,558,465
Other potash fertilizer material	6.0	23	1		399	2,645	1,055	.5	84,000
Total fertilizer		36,583	17,696	92.0	1,571,648	363,121	192,884	96.7	11,771,958
Used chiefly in chemical industries:									
Bicarbonate	46.0	12	6		2,253	42	19		5,994
Bitartrate:									
Argols	20.0	6,524	1,305		586,338	7,980	1,596		613,031
Cream of tartar	25.0	323	81		129,606	465	116		130,837
Carbonate	61.0	3	2		1,624	5,276	3,218		600,999
Caustic	80.0	36	29		14,412	813	650		143,758
Chlorate and perchlorate	36.0	158	57		29,360	343	123		52,541
Chromate and dichromate	40.0			8.0		149	60	3.3	28,683
Cyanide	70.0					713	499		467,985
Ferricyanide	42.0	1	(1)		1,186	94	39		61,528
Ferrocyanide	44.0					7	3		1,903
Nitrate	46.0	6	3		1,717	175	81		18,357
Permanganate	29.0	(1)	(1)		52	145	42		29,568
Rochelle salts	22.0					9	2		4,508
All other	50.0	73	37		20,361	322	161		63,319
Total chemical		7,136	1,520	8.0	786,909	16,533	6,609	3.3	2,223,011
Grand total		43,719	19,216	100.0	2,358,557	379,654	199,493	100.0	13,994,969

(1) Less than 0.5 ton.

TABLE 9.—Potash materials imported for consumption in the United States, 1949–50, by countries, in short tons

[Figures in parentheses in column headings indicate, in percent, approximate equivalent as potash (K_2O)]
[U. S. Department of Commerce]

Country	Bitartrate: Argols or wine lees (20)	Bitartrate: Cream of tartar (25)	Carbonate (61)	Caustic (hydroxide) (80)	Chlorate and perchlorate (36)	Cyanide (70)	Muriate (chloride) (56.4)	Potassium sodium nitrate mixtures, crude (14)	Potassium sulfate, crude (50)	All other [1]	Total: Short tons	Total: Value
1949												
Algeria	2,943										2,943	$240,392
Belgium-Luxembourg										6	6	1,949
Canada	2			(2)	2		1,049			23	1,076	52,315
Chile	66				101			6,802		1	6,970	337,932
China			3				(2)				3	1,707
Czechoslovakia										6	6	924
France	1,524						28,077			1	29,602	1,342,697
French Morocco	497										497	35,884
Germany									631	29	660	37,683
Italy	927	226									1,153	190,377
Norway										(2)	(2)	35
Portugal	400	10									410	38,433
Spain		87									87	27,228
Sweden				36						33	69	19,410
Switzerland					55						55	7,683
Tunisia	165										165	11,091
United Kingdom										17	17	12,817
Total	6,524	323	3	36	158		29,126	6,802	631	116	43,719	2,358,557
1950												
Algeria	1,900										1,900	135,337
Belgium-Luxembourg			55	66			250			99	470	56,923
Canada				23	6		49			9	87	13,396
Chile					25			20,409			20,434	888,111
China			4								4	1,862
Czechoslovakia				1		154				133	288	111,827
France	2,017	3	186	11		39	58,703		2,523	52	63,534	2,171,130
French Morocco	118										118	7,379
Germany			4,783	463		307	137,393		40,598	3,029	186,573	6,403,379
Italy	1,725	190								1	1,916	178,000
Japan										(2)	(2)	100
Lebanon							1,003				1,003	35,964
Netherlands			28			3	110			52	193	36,716
Norway										1	1	2,846
Poland-Danzig				110			31,540		904		32,554	1,011,500
Portugal	802										802	61,170
Spain		272					49,000				49,272	1,868,411
Sweden			220	139						165	524	97,161
Switzerland					312	(2)					312	45,793
Tunisia	1,418										1,418	86,104
U. S. S. R.							17,874		100		17,974	605,502
United Kingdom			(2)			210				67	277	176,358
Total	7,980	465	5,276	813	343	713	295,922	20,409	44,125	3,608	379,654	13,994,969

[1] Approximate equivalent as potash (K_2O)—1949–50: 37 percent.
[2] Less than 0.5 ton.

Exports.—Exports of potash materials declined in 1950 both in quantity and value, dropping to 117,137 short tons (65,047 tons K_2O) and $5,534,271. Decreases were registered in both fertilizer and chemical potash. The fertilizer materials (107,972 short tons) went mainly to Canada, but considerable tonnages also went to Cuba and Brazil. Exports of chemical potash salts (9,165 tons) were more uniformly distributed, Canada, Brazil, and Mexico being the leading recipients, with 2,960 tons, 2,161 tons, and 1,222 tons, respectively.

TABLE 10.—Potash materials exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Fertilizer		Chemical		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	96,822	$2,983,751	23,905	$5,055,441	120,727	$8,039,192
1947	102,939	3,251,645	21,970	5,434,462	124,909	8,686,107
1948	104,176	3,498,240	23,892	4,790,715	128,068	8,288,955
1949	111,156	3,818,006	[1] 15,601	[1] 3,292,829	[1] 126,757	[1] 7,110,835
1950	107,972	3,813,000	9,165	1,721,271	117,137	5,534,271

[1] Revised figure.

TABLE 11.—Potash materials exported from the United States, 1949–50, by countries of destination

[U. S. Department of Commerce]

Country	Fertilizer				Chemical			
	1949		1950		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Argentina					29	$12,107	13	$5,806
Australia					202	40,000	6	5,476
Austria					320	85,824	9	4,155
Barbados	4,133	$165,445	2,131	$91,502				
Belgium-Luxembourg					503	89,465	155	23,606
Brazil	10,407	456,726	13,349	603,362	1,157	278,544	2,161	379,782
Canada	76,085	2,389,830	66,440	2,175,405	2,971	458,014	2,960	392,500
Chile					[1] 83	[1] 27,616	51	16,719
China					486	115,743	160	32,657
Colombia	1,197	45,020	2,073	76,197	464	118,008	568	129,704
Cuba	12,723	496,574	16,514	592,870	130	39,796	253	65,025
Denmark					140	25,550		
Dominican Republic	400	17,066	645	29,112	16	3,649	3	1,170
Germany					729	171,160		
Greece					209	68,603	7	3,101
Guatemala	14	966	20	1,213	118	29,371	89	22,076
Hong Kong					2,131	410,874	139	27,457
Iceland					9	2,634		
India					[1] 272	76,432	141	42,888
Italy					1,293	221,412	96	20,616
Jamaica	857	39,744			10	2,371		
Leeward Islands	531	22,530	573	25,567	1	412		
Mexico	1,536	43,511	3,986	136,923	1,064	288,585	1,222	294,468
Netherlands					155	42,206		
New Zealand					9	2,412	2	343
Norway					34	10,930	7	2,702
Peru					67	20,284	39	10,302
Philippines	1,659	66,048	1,034	31,403	118	33,113	89	32,209
Portugal					17	4,494	1	885
Sweden					180	16,535	330	15,532
Switzerland	55	2,151			407	79,139	52	13,244
Trinidad and Tobago	674	30,223			1	260		
Turkey					808	122,331		
Union of South Africa					414	64,807	16	9,847
United Kingdom					2	1,978	3	4,612
Uruguay	100	4,068	168	6,827	27	8,766	34	6,850
Venezuela	141	10,618	115	5,523	180	49,003	126	36,248
Yugoslavia					1	656	4	5,171
Other countries	644	27,486	924	37,096	[1] 844	269,745	429	116,120
Total	111,156	3,818,006	107,972	3,813,000	[1] 15,601	[1] 3,292,829	9,165	1,721,271

[1] Revised figure.

WORLD REVIEW

Available statistics of potash output in the various producing countries, as well as estimated totals of world production, are shown in table 12.

TABLE 12.—World production of potassium salts and equivalent K_2O, by countries,[1] 1945–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1] and type of salt	1945		1946		1947	
	Potassium salts	Equivalent K_2O	Potassium salts	Equivalent K_2O	Potassium salts	Equivalent K_2O
North America: United States, potassium salts	1,440,879	793,096	1,531,079	845,321	1,728,882	934,282
Europe:						
France (Alsace), crude potassium salts	855,730	144,701	3,558,760	574,495	4,168,725	632,844
Germany, crude potassium salts (carnallite, kieserite, kainite, sylvinite, and hartsalz):						
Federal Republic	(2)	850,000	2,648,842	288,558	3,455,586	342,409
Soviet Zone			(2)	658,600	(2)	[3] 720,000
Spain, crude potassium salts (salable)	710,496	269,795	365,207	136,541	622,153	195,892
Asia:						
China	(2)	(2)	(2)	(2)	1,000	(2)
India, nitrate of potash [4]	7,587	3,759	3,512	1,727	(2)	(2)
Israel-Jordan[5]	93,625	46,800	90,571	45,300	123,163	61,600
Japan, alunite	----------	----------	----------	----------	2,259	(2)
Africa: Eritrea, chloride	----------	----------	----------	----------	----------	----------
Australia:						
New South Wales, alunite	641	48	727	54	406	30
Western Australia, alunitic mud	21,975	414	35,700	529	34,882	572
Total (estimated)	----------	2,180,000	----------	2,700,000	----------	3,000,000

Country [1] and type of salt	1948		1949		1950	
	Potassium salts	Equivalent K_2O	Potassium salts	Equivalent K_2O	Potassium salts	Equivalent K_2O
North America: United States, potassium salts	1,939,998	1,034,077	1,865,715	1,014,586	2,033,030	1,167,325
Europe:						
France (Alsace), crude potassium salts	4,461,247	691,252	5,280,000	896,000	(2)	1,017,800
Germany, crude potassium salts (carnallite, kieserite, kainite, sylvinite, and hartsalz):						
Federal Republic	5,276,348	538,507	7,290,000	788,800	8,926,700	911,600
Soviet Zone	(2)	[3] 823,000	(2)	(2)	(2)	(2)
Spain, crude potassium salts (salable)	992,743	151,185	918,156	137,700	1,013,243	152,000
Asia:						
China	(2)	(2)	(2)	(2)	(2)	(2)
India, nitrate of potash [4]	(2)	(2)	(2)	(2)	(2)	(2)
Israel-Jordan[5]	[6] 9,724	[6] 5,834	----------	----------	----------	----------
Japan, alunite	1,984	(2)	3,544	(2)	(2)	(2)
Africa: Eritrea, chloride	115	(2)	420	(2)	(2)	(2)
Australia:						
New South Wales, alunite	712	53	436	33	(2)	(2)
Western Australia, alunitic mud	39,759	652	32,782	1,471	(2)	(2)
Total (estimated)	----------	3,500,000	----------	4,000,000	----------	4,400,000

[1] In addition to countries listed, Chile, Ethiopia, Iran, Italy, Korea, and U. S. S. R. are reported to produce potash salts, but statistics of production are not available; estimates by senior author of chapter included in total. (Estimate for Chile included only for 1949–50.)
[2] Data not available; estimate by author of the chapter included in total.
[3] Estimate.
[4] Exports plus consumption, 1945–46.
[5] Production in fiscal years 1945–48 is for Palestine. Extracted from waters of Dead Sea.
[6] Production January through April when work was discontinued due to destruction of the Palestine Potash Co.'s large plant during hostilities of 1948.

The potash deposits of Germany, France, and Spain were described in a paper published early in 1950.[8]

Australia.—Potassium fertilizer is produced in Australia principally by the State Alunite Works of Western Australia, but small amounts are also obtained by precipitation of the flue dust from the kilns of some cement works.[9]

The plant of the State Alunite Works at Lake Campion has been producing a crude fertilizer containing 30 percent K_2O at a rate of 100 tons per week. The works are reported to be testing several process modifications that promise to give a better potassium yield and to enable the recovery of sodium sulfate and potassium chloride in addition to potassium sulfate. The present expansion program looks forward to a daily production of 40 tons of fertilizer containing 50 percent K_2O.

The potassium-bearing deposit consists of the finely divided mud, composed mainly of particles of alunite, forming the bed of the lake. This alunitic mud has an average content of 60 percent alunite and 21 percent silica; when air-dried it contains 13.5 percent potassium sulfate. Details of the process follow: [9]

By the original process the crushed airdried mud is heated in a rotary kiln to 700 degrees C. to 800 degrees C. so as to render the potash soluble in the raw material. The calcined fragments after cooling and reiheating are then passed on to a continuous leaching plant. It has now been establ shed that a more economic yield of potassium salts can be obtained by roasting a finely powdered mixture of the material with common salt to about 600 degrees C. and quenching the roasted charge with water, brine, or, preferably, magnesium chloride solution.

* * * Ordinarily only crude sulphate of potassium is obtained by fractional crystallization of the liquor, followed by centrifuging. However, by adding salt to the effluent and increasing the temperature to near boiling point anhydrous sodium sulphate can be made to crystallize out. The solution separated from the anhydrous sodium sulphate is evaporated and the mixed salts thus obtained are subjected to an ingenious flotation treatment, yielding a practically pure potassium chloride, mixed salt and glaserite.

The problem of separating the sulphates of sodium and potassium has been solved by forming a saturated solution (with respect to K) at about boiling point. Common salt is then added to the solution until it is saturated with respect to NaCl. The potassium chloride is crystallized out by cooling the solution in two stages, ultimately to 5 degrees centigrade.

Canada.—Discovery of potash in the Duperow-Crown No. 1 well southwest of Biggar has been officially announced. The Duperow-Crown No. 1 well was drilled and cored by the Tidewater Associated Oil Co., which turned the salt-potash core over to the Department of Natural Resources for sampling. From analyses by the Dominion Bureau of Mines, this core showed a section containing 19 percent potassium oxide over 20 inches, or a larger section of 4 feet 2 inches in length with a potash content of 9.8 percent. The salt-potash zone was encountered at a depth of over 4,000 feet.[10]

The Province of Saskatchewan has announced regulations under the Mineral Resources Act for leasing crown-owned potash rights to private concerns. The regulations provide for the issuance of exploration permits, leasing of mineral rights on a 21-year renewable term, reservation of areas as mineral reserves, and royalties. A maximum

---

[8] Smith, J. P., Geology of Potash Deposits: Trans. Am. Inst. Min. and Met. Eng., vol. 187, January 1950, pp. 117–121.

[9] Chemical Engineering, Aussies Working on Higher Potash Fertilizer Yields: Vol. 57, No. 1, January 1950, p. 205.

[10] Canadian Mining Journal, Saskatchewan, Potash Discovery: Vol. 72, No. 1, January 1951, p. 81.

of two exploration permits for areas up to 100,000 acres each may be issued to one applicant. Requirements include a deposit of $20,000 as a guarantee and completion of $60,000 worth of work the first year and $80,000 in each succeeding year.

Saskatchewan potash is said to have been discovered during oil-well drilling not only in the Biggar, but also in the Unity, and Yorkton areas. All discoveries so far are said to have been on crown-owned land.

Ethiopia.—Exploitation of potash deposits in the northeastern part of Ethiopia near the Eritrean border are reported to have yielded a production of about 2,000 metric tons in 1949, all of which was used domestically for fertilizer. Concessions for development are reported to have been granted to an American-Swiss syndicate, which intended to begin operations before the end of 1950.

France.—Beds of sylvinite containing 14–19 percent K_2O are being mined in the Landes south of the town of Dax by the Société Minière du Sud Ouest de la France, with the help of the Mines Domaniales de Potasse d'Alsace. The present depth of the mine shaft is 725 meters, and there is a total of 10 kilometers of workings at six different levels. The mine has just been equipped for the extraction of 600 tons of ore a day, which will be used in agriculture in the crude state pending construction of a concentration plant at present under consideration. Reserves are estimated to be about 3 million tons of ore.[11]

Israel and Jordan.[12]—All operations of the Palestine Potash, Ltd., on the Dead Sea have been at a standstill since April 1948. The plant at the northern end of the sea remains in the hands of Hashemite Jordan. No representative of the company has been able to visit these premises, but the company reports that it has been told the buildings have been largely demolished and their contents removed. The company property at the south end of the Dead Sea, which had been occupied by the Israel military forces in May 1948, was handed back to the company in August 1949: it is reported to have been in fair condition. Palestine Potash, Ltd., continued negotiations in 1950 calculated to resume operations at a rate of 135,000 tons of potash per year. The Israel Government is constructing a road from the works at the southern end of the Dead Sea to Beersheba. After completion of this road it will be possible for the company to transport potash from the southern plant to an Israel port.

Spain.—According to Boletin Oficial del Estado, the Spanish Ministry of Industry and Commerce has granted exploitation rights to the Instituto Nacional de Industria (INI) of potassium salt deposits in the Province of Navarra, consisting of about 19,000 hectares. According to the application made by INI to exploit these deposits, discoveries of rich beds of potassium salts have been made in the area by the Spanish Geological Institute. The deposits are said to be close to the surface, conveniently located with regard to rail and highway transportation, and not too distant from port facilities. It is believed that it will be at least 5 years before mining of any

---

[11] Chemistry and Industry (London), Potash Mines in the Landes: No. 48, Dec. 2, 1950, p 768.

[12] Baroway, Aaron, vice president, Palestine Economic Corp., communication to Bertrand L. Johnson, May 4, 1951.

Palestine Potash, Ltd., acting chairman's speech to the 20th Annual General Meeting, October 31, 1950, 1 p.

sizable commercial quantities will be effected in this area by INI, principally because of the large expenditures involved in purchasing and installing suitable mining machinery and transportation equipment.[13]

United Kingdom.—Considerable information is now available regarding the recently discovered Permian potash field in the northeastern part of the North Riding district of Yorkshire, England, near the North Sea coast town of Whitby.[14]

The potash deposits lie at the gently sloping western end of the great potash-bearing basin of Zechstein (Permian) rocks, which also contains the great German deposits. These potassium-bearing sediments were laid down in a great sea, which in Zechstein time extended from what is now central Europe westward across the area now occupied by the present North Sea into the region of present northern England and Iceland. The Yorkshire potash beds are apparently nearly horizontal, dipping gently northeastward under the North Sea. The depth to the upper potash bed near the coast is 3,867 feet.

In that portion of the Permian beds cut in the existing borings, three thick salt beds were passed through. The sylvite (KCl) deposits lie 3,675 to 4,246 feet below the surface. One sylvite zone occurs in the upper salt bed and another in the middle salt bed. These two zones are separated from each other by intervals ranging from 48 to 137 feet in the different borings. Large quantities of polyhalite occur in the lower salt bed in two of the boreholes; the polyhalite-bearing zone extends to below 5,000 feet below the surface.

Development work in this area has been restricted to well-drilling. Five wells have cut the potash beds—four in the Whitby area and one near Robin Hood Bay, 4 miles southeast. The D'Arcy well in the Whitby area was put down in 1938. The other three wells were drilled in 1948 and 1949 by Imperial Chemical Industries.

In the Whitby area the reserves have been estimated to underlie an area of 12 square miles. The sylvite-bearing zone in the upper salt bed, 20 feet thick with an average content of 17 percent KCl, is estimated to contain 63.5 million tons of potassium chloride (KCl). The potash-bearing zone in the middle salt bed, averaging 25 feet in thickness, with a 32-percent potassium chloride (KCl) content, is estimated to contain 150 million tons KCl. Assuming a total reserve of 200 million tons, 35 percent of which can be extracted, gives a recoverable reserve of 70 million tons of KCl. The full extent of the field is not yet known, and there may be much more potash than now estimated, as there is no evidence that the present boreholes lie on the edges of the deposit.

---

13 Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 2, February 1950, p. 43.

14 Fleck, Alexander, Deposits of Potassium Salts in North-East Yorkshire: Chem. and Ind. (London), Oct. 17, 1950, pp. S1–S15. Paper read before the Newcastle Section of the Society of Chemical Industry in the Lecture Theatre of the New Chemistry Department, King's College, Newcastle-upon-Tyne, on Oct. 17, 1950.

Chemical Trade Journal (London), Potash in North Yorkshire—Some Possibilities of Economic Production: Vol. 125, 1949, pp. 123–124.

Lees, G. M., and Taitt, A. H., The Geological Results of the Search for Oil Fields in Great Britain: Quart. Jour. Geol. Soc. London, vol. 101, 1945, pp. 252–317.

These deposits lie at a greater depth than those of any potash region now producing and are at greater depths than any known deposit except the recently discovered field in the Province of Saskatchewan, Canada, where the potassium-bearing beds lie 3,466 to 7,677 feet below the surface. The Yorkshire beds, however, compare well in thickness and potash content with the average of commercially worked beds.

British consumption is said to be currently about 235,000 tons of KCl a year for agricultural use, and this could well be increased to 400,000 tons a year, with another 100,000 tons for industrial use. Assuming an annual United Kingdom consumption of 500,000 tons of KCl, the present known recoverable reserve would suffice for 140 years. The prospect of satisfying the demand from domestic sources, with a further likelihood of having an export surplus, is one of great importance to the British economy. When developed, these potash resources will make the United Kingdom self-sufficient and will create a new British industry. There is no indication as yet as to when production on a commercial basis will commence, the chief problem to be solved at the moment being choice of the extraction method to be used.

Salines—Miscellaneous

By Joseph C. Arundale and F. M. Barsigian[1]

GENERAL SUMMARY

INCREASING production and sales, which began in the latter part of 1949 after a slump in the earlier part of the year, continued into 1950, and sales of many chemical materials set new all-time records. The military activity in Korea starting near the middle of the year, spurred industrial activity and caused demand for many of the chemical raw materials to rise sharply. At the end of the year production of many chemical compounds was sharply accelerated as the National Defense Program got under way. In this period the prices of many chemical raw materials were also increased.

Boron minerals were produced at a record high. Sales of bromine compounds were the highest for any year except the war year 1944. Sales of calcium chloride approached a record. Imports of iodine from Japan continued to increase. There was a serious shortage of soda ash because of increased demand and interruption of production by a strike in the industry. Salt-cake supplies were tight at the end of the year. The output of sodium metal was increased by production from a new plant.

CALCIUM CHLORIDE

Sales of calcium chloride increased nearly to the record high of 1948. Inventories generally were sufficient to meet all requirements.

An article was published reviewing the use of calcium chloride in portland cement. With the object of producing low-alkali cement, the amount of sodium oxide and potassium oxide in portland-cement clinker is reduced by adding calcium chloride to the kiln feed. The molecular sum of the alkalis removed was found to be proportional to the quantity of calcium chloride added.[2]

The Calcium Chloride Association sponsored development of a device for feeding flake calcium chloride to concrete mixers on large concrete projects and in ready-mix concrete plants. The flake is fed from a hopper into a cylindrical container, the capacity of which can be adjusted by means of removable wooden plugs. When a lever on the container is moved it revolves the cylinder. When the opening is directed toward the bottom of the hopper, a measured quantity of calcium chloride is dropped into the mixer. The lever on the side of the cylinder is opened and closed by an arm attached to the skip.[3]

---

1 Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

2 Holden, E. R., Reduction of Alkalies in Portland Cement, Use of Calcium Chloride: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 337-341.

3 Concrete, April 1950, pp. 40-41.

TABLE 1.—Calcium chloride and calcium-magnesium chloride from natural brines sold by producers in the United States, 1945–50

[In terms of 75 percent (Ca, Mg) Cl_2]

Year	Short tons	Value	Year	Short tons	Value
1945	218, 320	$1, 818, 219	1948	309, 660	$3, 906, 858
1946	262, 147	2, 278, 954	1949	255, 797	3, 260, 675
1947	271, 206	2, 650, 205	1950	299, 821	3, 801, 508

TABLE 2.—Calcium chloride imported for consumption in and exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Imports		Exports	
	Short tons	Value	Short tons	Value
1946	1, 313	$14, 587	10, 073	$367, 993
1947	250	5, 514	11, 955	502, 818
1948	5	249	11, 456	437, 763
1949	1	20	21, 094	507, 845
1950	1, 881	54, 170	15, 624	403, 406

As a result of increased demand for calcium chloride in Canada, Brunner-Mond & Co., Ltd., undertook a major expansion of its facilities at Amherstburg, Ontario.[4]

A new-type polyethylene-lined paper bag for flake calcium chloride packaging was adopted by Solvay Sales Division, Allied Chemical & Dye Corp. It is said to have high resistance to moisture and long storage life and not to be affected by extremes of temperature.[5]

Dow Chemical Co. increased its production of anhydrous calcium chloride pellets offered for the past two seasons only in limited quantities.[6]

A Bureau of Mines report described the effects of rubber-tired coal-mine shuttle cars on mine road beds dusted with calcium chloride.[7]

The following companies produced calcium chloride (and calcium magnesium chloride) from natural brines in 1950: California Rock Salt Co., 2436 Hunter St., Los Angeles 21, Calif., plant at Amboy, Calif.; Hill Bros. Chemical Co., 2159 Bay St., Los Angeles 21, Calif., plant at Amboy, Calif.; Michigan Chemical Corp., 500 N. Bankson, St. Louis, Mich.; Wilkinson Chemical Co., Mayville, Mich.; Dow Chemical Co., Midland, Mich.; Pomeroy Salt Corp., Pomeroy, Ohio, plant at Minersville, Ohio; Westvaco Chemical Division, Food Machinery & Chemical Corp., South Charleston 3, W. Va.; Liverpool Salt Co., Hartford, W. Va.; and Desert Properties Co., Frank Thomas, receiver, 374 Court St., San Bernardino, Calif., plant at Amboy, Calif. National Chloride Co. of America, Room 634, 354 S. Spring St., Los Angeles, Calif., acquired the Desert Properties Co. on June 1.

[4] Canadian Chemistry and Process Industries, vol. 34, No. 2, February 1950, p. 149.
[5] Chemical Industries, vol. 66, No. 4, April 1950, p. 588.
[6] Wall Street Journal, vol. 136, No. 78, Oct. 2, 1950, p. 2.
[7] Nicholas, R. H., Whittaker, J. S., and Dornenburg, D. D., Shuttle-Car Tire and Road-Bed Study: Bureau of Mines Rept. of Investigations 4624, 1950, 22 pp.

According to Oil, Paint and Drug Reporter, the following prices for calcium chloride were quoted during 1950: Flake, 77 to 80 percent, paper bags, carlots, freight equalized, $22 per ton at the beginning of the year, advanced to $23.50 per ton in July and was quoted up to $25 per ton by October; liquor, works, basis 40 percent, tank cars, $9 per ton at the beginning of the year, increased to $9.75 per ton in July and was quoted up to $10.50 per ton by October; pellets, bags, carlots, works, $29 per ton at the beginning of the year, advanced to $31 per ton in July and were quoted up to $31.25 per ton by October; solid, 73 to 75 percent, drums, carlots, works, same basis, quoted at $20 per ton at the beginning of the year, advanced to $22 per ton at midyear, and further advanced to $23.50 per ton by October. October prices for these materials were still in effect at the end of the year.

BROMINE

Sales exceeding 98,000,000 pounds of bromine and bromine in compounds were the highest for any year except the war year 1944, when ethylene dibromide for manufacturing "knockless" gasoline for military aircraft accounted for much of the higher level of demand. Since the war, increased automotive fuel consumption, a preference for knockless gasoline, and the trend toward higher-compression motors have created a demand exceeding the capacity of producers. Producers were planning expansion of facilities.

The Ethyl-Dow Chemical Co., the largest producer of bromine in the United States, increased its sales of ethylene dibromide from its sea-water operation at Freeport, Tex. The Dow Chemical Co., Midland, Mich., second-largest producer, recovered bromine from Michigan well brines. American Potash & Chemical Corp., 3030 W. Sixth St., Los Angeles 54, Calif. recovered bromine from Searles Lake, and Westvaco Chemical Division, Food Machinery & Chemical Corp., 405 Lexington Ave., New York 17, N. Y., from its sea-water bitterns plant at Newark, Calif. The following recovered bromine from Michigan well brines: Great Lakes Chemical Corp., 502 Michigan National Bank Bldg., Grand Rapids 2, Mich., plant at Filer City, Mich.; Michigan Chemical Corp., 500 N. Bankson, St. Louis, Mich.; and Morton Salt Co., 120 S. LaSalle St., Chicago 3, Ill., plant at Manistee, Mich. Rademaker Chemical Corp., Eastlake, Mich., did not operate in 1950. Pomeroy Salt Corp., Pomeroy, Ohio, plant at Minersville, Ohio, and Westvaco Chemical Division, Food Machinery & Chemical Corp., South Charleston 3, W. Va., also recovered bromine from well brines.

TABLE 3.—Bromine and bromine in compounds sold or used by producers in the United States, 1945–50

Year	Pounds	Value	Year	Pounds	Value
1945	79,709,857	$14,796,229	1948	76,047,551	$14,825,470
1946	42,780,925	8,560,434	1949	88,725,709	16,267,908
1947	78,177,650	14,837,104	1950	98,502,300	18,794,978

TABLE 4.—Bromine and bromine compounds sold by primary producers in the United States, 1949–50

	1949			1950		
	Pounds		Value	Pounds		Value
	Gross weight	Bromine content [1]		Gross weight	Bromine content [1]	
Elemental bromine	3,428,476	3,428,476	$539,355	4,063,314	4,063,314	$760,274
Sodium bromide	808,922	628,128	209,041	993,614	771,541	256,942
Potassium bromide	1,925,997	1,293,307	498,603	2,879,256	1,933,420	748,253
Ammonium bromide	264,862	216,075	77,509	403,190	328,922	116,868
Other including ethylene dibromide	98,407,345	83,159,723	14,943,400	108,079,443	91,405,103	16,912,641
Total	104,835,602	88,725,709	16,267,908	116,418,817	98,502,300	18,794,978

[1] Calculated as theoretical bromine content present in compound.

According to Oil, Paint and Drug Reporter, purified bromine in cases, freight allowed, east of the Rockies, or in drums, lead-lined, delivered, was quoted at 21 cents per pound at the beginning of 1950, advanced to 23 cents per pound about the middle of the year, and advanced again to 25 cents per pound in December. Potassium and sodium bromides, U.S.P., were quoted at 33–34 cents per pound at the beginning of the year and by the end of the year were quoted at 34–35 cents per pound for sodium bromide and 34–37 cents per pound for potassium bromide.

IODINE

Dow Chemical Co. of Midland, Mich., and Deepwater Chemical Co., Ltd., Compton, Calif., recovered iodine from waste oil-field brines in California. As there were only two domestic producers during 1950, the Bureau of Mines may not publish the statistics on production of iodine. Imports of crude iodine increased over the previous year. However, imports are characteristically erratic and generally bear little relation to current rates of consumption. Large stocks usually are maintained in consuming countries, principally the United States, by Chilean Nitrate Sales Corp., sales agent for producers in Chile. Chile remained the principal foreign source of iodine, but imports from Japan nearly doubled those in the previous year and represented a substantial part (20 percent) of imports.

The history of titanium tetraiodide was reviewed and a new method for its preparation described. This compound is of special interest in titanium metallurgy, because it may be decomposed thermally to yield titanium metal. The procedure described may have value for qualitative and quantitative determination of metallic titanium.[8]

[8] Blumenthal, Warren B., and Smith, Howard, Titanium Tetraiodide, Preparation and Refining: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 249-251.

TABLE 5.—Crude iodine consumed in the United States in 1949–50

Compound manufactured	1949			1950		
	Number of plants	Crude iodine consumed		Number of plants	Crude iodine consumed	
		Pounds	Percent of total		Pounds	Percent of total
Resublimed iodine	5	117,965	11	5	145,534	11
Potassium iodide	9	753,911	69	8	1,014,940	73
Sodium iodide	5	42,453	4	5	59,818	4
Other inorganic compounds	7	34,676	3	7	57,705	4
Organic compounds	12	145,553	13	12	114,148	8
Total	[1] 22	1,094,558	100	[1] 22	1,392,145	100

[1] A plant producing more than 1 product is counted but once in arriving at total.

TABLE 6.—Crude iodine imported for consumption in the United States, 1945–50

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value
1945	220,526	$232,070	1948	592,136	$847,752
1946	886,578	976,190	1949	489,999	719,758
1947	2,260,506	2,756,888	1950	724,858	1,055,946

The iodide process for producing titanium metal has not been used for large-scale production; however, it is a satisfactory means of producing high-purity titanium for studying the metal and its alloys. In preparing pure titanium by the iodide process, crude titanium is reacted with iodine in an evacuated bulb at such temperature as to form volatile titanium iodides, which are decomposed on a heated titanium filament.[9]

Crude iodine advanced during the year to $1.73 per pound for domestic and $1.70 per pound for Chilean imported material, according to Oil, Paint and Drug Reporter.

A very useful publication entitled "Iodine Abstracts and Reviews" is published periodically by the Chilean Iodine Educational Bureau, Inc., 120 Broadway, New York 5, N. Y. This bulletin is prepared by the Chilean Iodine Educational Bureau, Inc., Fellowship at Mellon Institute.

As a result of tests on the use of iodine compounds for disinfecting drinking water, a committee of the National Research Council is recommending to the Surgeons General of Army, Navy, and Air Force that the services adopt and standardize a compound releasing free iodine in concentrations of 8 p. p. m., although only for individual disinfection of drinking water in canteen quantities. The compound used in these tests was sodium iodide.[10]

[9] Steel, Developments in Titanium and Titanium Alloys: Vol. 124, No. 25, June 20, 1949, pp. 101–104 132, 135.
[10] Chemical and Engineering News, vol. 28, No. 23, June 5, 1950, p. 1895.

SODIUM COMPOUNDS

Sodium Carbonate.—The soda-ash industry, facing a general oversupply in 1949 could not meet increased demand in 1950, as industrial activity accelerated and consumers attempted to build up inventory. A serious strike curtailed production from June until September. This shortage of soda ash had an adverse effect on many industries using this basic chemical material. Shortage of soda ash closed many of the country's glass plants. Imports were greatly increased during this period.

As a result of the shortage in supply, consumption of sodium carbonate in the United States in 1950 was slightly less than in 1949. Even greatly increased imports were not adequate to fill the demand-supply gap. Production of pulp and paper, lime-soda caustic, sodium bicarbonate, and many other products suffered from lack of soda ash. Exports were off sharply. Production of natural sodium carbonates—only a small percentage of the total soda ash supply—was nearly double that of 1949.

Natural soda ash was produced in California by the following companies in 1950: American Potash & Chemical Corp., 3030 W. Sixth St., Los Angeles 54, Calif., on Searles Lake; Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland 12, Calif., on Owens Lake; Natural Soda Products Co., 405 Montgomery St., San Francisco 4, Calif., plant at Keeler; Pittsburgh Plate Glass Co., Columbia Chemical Division, Bartlett, Calif.; and West End Chemical Co., 608 Latham Square Bldg., Oakland 12, Calif., plant at Westend. Westvaco Chemical Division, Food Machinery & Chemical Corp., 405 Lexington Ave., New York 16, N. Y., reported production from its trona operation in Great River, Wyo.

TABLE 7.—Manufactured sodium carbonate produced [1] and natural sodium carbonates sold or used by producers in the United States, 1946–50

Year	Manufactured soda ash (ammonia-soda process) [2]	Natural sodium carbonates [3]	
	Short tons	Short tons	Value
1946	4,284,231	215,625	$3,427,086
1947	4,524,668	293,051	5,862,178
1948	4,575,452	[4] 288,769	[4] 6,623,280
1949	3,916,016	[4] 200,496	[4] 4,163,714
1950	3,991,199	351,075	7,543,769

[1] U. S. Bureau of the Census.
[2] Total wet and dry (98–100 percent Na_2CO_3). Includes quantities used in manufacturing caustic soda and sodium bicarbonate and quantities processed to finished light and finished dense soda ash.
[3] Soda ash and trona.
[4] Exclusive of Wyoming.

Installation of a new dredge on Lake Magadi in Kenya was expected to greatly increase the production of soda ash.[11]

An interesting article was published on the sodium salts used in detergents.[12]

[11] South African Mining and Engineering Journal, vol. 61, No. 2999, Aug. 5, 1950, p. 801.
[12] Niven, William W., Jr., and Gadberry, Howard, How Sodium Salts Work in Detergents: Chem. Ind. vol. 67, No. 1, July 1950, pp. 61–70.

The Australian Mining & Smelting Co. was granted temporary reserves in Western Australia totaling 5,000 square miles to search for alkalies.[13]

India increased the revenue duty on soda ash from 18 percent ad valorem to 40 percent ad valorem on imports from a British colony and from 30 percent ad valorem to 50 percent on imports under the standard rate applicable to those from the United States and the United Kingdom. In addition, a subsidy of 1 rupee per 112 pounds was to be paid to domestic producers.[14]

According to Oil, Paint and Drug Reporter, the prices of soda ash, dense, 58 percent, bulk, carlots, works, was quoted at $1.10 per 100 pounds at the beginning of the year and increased to $1.20 per 100 pounds in July and $1.30 per 100 pounds in October; light, same basis, was quoted at $1 per 100 pounds at the beginning of the year and advanced to $1.10 per 100 pounds in July and $1.20 per 100 pounds in October.

The consumption pattern of sodium carbonate, as estimated by Chemical Engineering, is shown in table 8.

TABLE 8.—Estimated consumption of sodium carbonate in the United States, 1946–50, by industries, in short tons

[Chemical Engineering]

Industry	1946	1947	1948	1949	1950
Glass	1,400,000	1,440,000	1,370,000	1,190,000	1,225,000
Soap	120,000	135,000	130,000	125,000	105,000
Caustic and bicarbonate	1,128,000	1,130,000	1,137,000	[1] 875,000	700,000
Other chemicals	910,000	1,030,000	1,030,000	950,000	1,050,000
Cleansers and modified sodas	125,000	130,000	135,000	130,000	110,000
Pulp and paper	190,000	260,000	230,000	200,000	200,000
Water softeners	90,000	100,000	110,000	110,000	100,000
Petroleum refining	20,000	22,000	24,000	24,000	24,000
Textiles	77,000	71,000	69,000	55,000	65,000
Nonferrous metallurgy	140,000	190,000	210,000	210,000	245,000
Exports	67,000	107,000	207,000	[1] 76,000	50,000
Miscellaneous	223,000	185,000	220,000	[1] 175,000	151,000
Total	4,490,000	4,800,000	4,872,000	[1] 4,120,000	4,025,000

[1] Revised figure.

Sodium Sulfate.—Sales of natural sodium sulfate in the United States remained virtually the same as in the previous year.

Demand for salt cake was steady in the early months of 1950, and inventories were adequate; however, during the latter part of the year, increased demands from the Kraft paper mills and from glass plants, as a result of the shortage of soda ash, depleted inventories, and by the end of the year the supply situation was somewhat tight.

Imports of crude salt cake and anhydrous sodium sulfate increased sharply in 1950. In Russia sodium sulfate rather than sodium carbonate is used in glass batches. The results of such practice on the roof and walls of the furnace were described in an article.[15]

The following firms reported production in 1950: American Potash & Chemical Corp., 3030 W. Sixth St., Los Angeles 54, Calif., on Searles Lake; Iowa Soda Products Co., P. O. Box 476, Council Bluffs,

[13] Foreign Commerce Weekly, vol. 41, No. 8, Nov. 20, 1950, p. 18.
[14] Oil, Paint and Drug Reporter, vol. 158, No. 6, Aug. 7, 1950, p. 40.
[15] Polinkovskaya, A. I., Savinov, V. T., and Solomin, N. V., Corrosion of Refractories in the Flame Zone of Gas Furnaces: Steklo i Keramika (Glass and Ceramics), April 1950, pp. 16–20.

Iowa, plant at Rawlins, Wyo.; Ozark-Mahoning Co., P. O. Box 449, Tulsa 1, Okla., plant at Monahans, Tex.; and Wm. E. Pratt, P. O. Box 738, Casper, Wyo.

According to Oil, Paint and Drug Reporter, salt cake, bulk, works, was quoted at $22 per ton at the beginning of the year, dropped to $15 per ton in August, and increased to $17 per ton in October. Anhydrous sodium sulfate, technical grade, bags, carlots, works, was quoted at $2.10 per 100 pounds at the beginning of the year and decreased to $2 per 100 pounds early in the year. Glauber's salt, anhydrous, crystalline, bags, carlots, works, was quoted at $2 per 100 pounds at the beginning of the year, dropped to $1.60 per 100 pounds in February, and in October was quoted at $45 per ton, freight allowed.

TABLE 9.—Sodium sulfate produced and sold or used, by producers in the United States, 1946–50

Year	Production (manufactured [1] and natural), short tons			Sold or used by producers (natural only)	
	Salt cake (crude)	Glauber's salt (100 percent $Na_2SO_4.10H_2O$)	Anhydrous refined (100 percent Na_2SO_4)	Short tons [2]	Value
1946	527,746	167,153	122,573	198,781	$1,695,413
1947	693,517	202,285	134,969	257,294	3,329,094
1948	668,246	184,744	169,018	265,862	4,248,613
1949	537,843	156,634	136,276	186,223	2,733,853
1950	561,395	185,626	184,254	186,537	2,199,336

[1] U. S. Bureau of the Census.
[2] Includes Glauber's salt converted to 100-percent Na_2SO_4 basis.

TABLE 10.—Sodium sulfate imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Crude (salt cake)		Crystallized (Glauber's salt)		Anhydrous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	22,446	$352,407					22,446	$352,407
1947	49,157	583,377	91	$1,760			49,248	585,137
1948	29,612	468,561					29,612	468,561
1949	21,090	294,367	53	1,152	245	$4,953	21,388	300,472
1950	61,612	737,118			5,565	107,330	67,177	844,448

Sodium Metal.—The demand for sodium metal has been increasing for the past few years, and further increases are anticipated. Production in 1950 was greatly increased as a result of a plant expansion completed in 1949 by Ethyl Corp. at Baton Rouge, La. National Distillers Chemical Corp. shipped the first tankcar of sodium from its new plant at Ashtabula, Ohio, in June of 1950. Rated annual capacity of the new plant was reported to be 18,000 tons of sodium.[16]

E. I. du Pont de Nemours & Co., Inc., also produced sodium metal at Niagara Falls, N. Y.

The largest single use for sodium is in the manufacture of tetraethyl lead, an "antiknock" compound for gasoline. Other important uses are in dyes and in reducing fatty acid esters to fatty alcohols for use in the manufacture of synthetic detergents. The following is an approximate end-use pattern for sodium metal in 1947 and 1948; figures shown indicate millions of pounds.[17]

Use:	*1947*	*1948*
Tetraethyl lead	66	90
Sodium cyanide	25	32
Sodium alkyl sulfate	25	
Sodium peroxide	7	7
Sodium hydride	2	2
Indigo synthesis	2	2
Miscellaneous	6	6

The use of sodium as a reducing agent in the organic chemicals industry was summarized in an article.[18]

It was claimed that stable dispersions of sodium metal in a wide variety of solvents could be made. These dispersions average about 50 percent sodium in 1- to 50-micron particles. They are fluid at room temperatures and can be poured or pumped. It is hoped that the close feed-rate control made possible by this type of material and the large metal surface area afforded will broaden the market for sodium.[19]

According to Oil, Paint and Drug Reporter, prices of sodium metal at the end of 1950 were as follows: In tanks, works, 16 cents per pound; in bricks, drums, works, 17 to 18 cents per pound.

BORATES

Sales of boron minerals surpassed all previous years. Supplies, adequate in the early part of the year, were short in the latter part of the year, and the prices of most boron compounds were increased. Approximately half the boron minerals used are consumed by the glass and ceramics industry, the remainder going to a wide variety of uses.

The story of boron trifluoride as a useful chemical was told in a new booklet.[20]

---

[16] Oil, Paint and Drug Reporter, vol. 157, No. 26, June 26, 1950, p. 3.

[17] Zabel, Herman W., Metallic Sodium, Its Production and Use: Chem. and Ind., vol. 65, No. 5, November 1949, pp. 714–716.

[18] Chemical Age, vol. 62, No. 1594, Jan. 28, 1950, p. 164.

[19] Chemical and Engineering News, vol. 28, No. 30, July 24, 1950, p. 2493.

[20] Booth, Harold Simmons, and Martin, Donald Ray, Boron Trifluoride and Its Derivatives: John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London, 315 pp.

TABLE 11.—Salient statistics of boron minerals and compounds in the United States, 1946–50

	1946	1947	1948	1949	1950
Sold or used by producers: [1]					
Short tons:					
Gross weight	430,689	501,935	450,932	467,592	647,735
B_2O_3 content	129,800	145,700	134,700	139,200	191,000
Value [2]	$9,575,866	$11,844,108	$11,147,735	$11,511,893	$15,890,000
Imports for consumption (refined):					
Pounds	[3] 100,544	1,884	3,056	886	[4] 1,224
Value	[3] $4,043	$747	$1,503	$435	[4] $416
Exports:					
Short tons	53,303	85,736	70,940	109,491	142,580
Value	$2,644,760	$4,651,642	$4,075,049	$6,862,928	$8,301,081
Apparent consumption: Short tons [5]	377,436	416,200	379,994	358,101	505,167

[1] Borax, anhydrous sodium tetraborate, kernite, boric acid, and colemanite.
[2] Partly estimated.
[3] Revised figure.
[4] In addition, 21,286 pounds of crude valued at $200.
[5] Quantity sold or used by producers plus imports minus exports.

An investigation of eight hot-pressed oxides and carbonates for possible gas-turbine application was undertaken. The short-time tensile strength, thermal shock resistance, and density were determined for these materials, among which was boron carbide and 85 percent silicon carbide plus 15 percent boron carbide. Boron carbide had a short-time tensile strength of 22,550 pounds per square inch at 1,800° F., the highest at this temperature. The evaluation of strength of boron carbide at 2,200° F. was unsuccessful. Hot pressing of these bodies indicated that a density of at least 93 percent of theoretical density could be obtained.[21]

The House Ways and Means Committee voted to add borax along with several other materials to the 15-percent depletion-allowance group.[22]

A new proportional counter tube, sensitive to thermal neutrons, was made available. The boron-lined neutron counter tube will permit measurement of slow neutron intensity for nuclear scientific purposes.[23]

In 1950 the following firms reported production of boron minerals: American Potash & Chemical Corp., 3030 W. Sixth St., Los Angeles 54, Calif., plant at Trona, on Searles Lake; Pacific Coast Borax Co., 510 W. Sixth St., Los Angeles 14, Calif., mine at Boron; Pittsburgh Plate Glass Co., Columbia Chemical Division, Bartlett, Calif.; United States Borax Co., 510 W. Sixth St., Los Angeles 14, Calif., mine near Shoshone; West End Chemical Co., 608 Latham Square Bldg., Oakland 12, Calif., plant at Westend, on Searles Lake.

It was reported that the Maria Elena Co. in Chile was building a new plant in which it would recover potassium and sodium nitrate, with additional quantities of sodium sulfate, iodine, and boric acid by a new process.[24]

According to Oil, Paint and Drug Reporter the price of technical-grade borax, granular, bulk, carlots, works, increased from $31.25 per ton at the beginning of the year to $33.25 per ton in October.

[21] Gangler, James J., Some Physical Properties of Eight Oxides and Carbides: Am. Ceram. Soc. Bull vol. 29, No. 3, March 1950, p. 120.
[22] Engineering and Mining Journal, vol. 151, No. 6, June 1950, p. 91.
[23] Chemical Industries, vol. 67, No. 1, July 1950, p. 112.
[24] Bureau of Mines, Mineral Trade Notes, vol. 30, No. 6, June 1950, p. 43.

Salt

By Florence E. Harris and F. M. Barsigian

GENERAL SUMMARY

HIGHER production of all three types of salt in the United States resulted in a total output of 16,629,809 short tons valued at $59,911,343 in 1950. The details by classes are given in table 1. As 1950 completes the first half of the century, figures for 1901 are also included in table 1 for comparison.

TABLE 1.—Salient statistics of the salt industry in the United States, 1901 and 1946–50 [1]

	1901	1946	1947	1948	1949	1950
Sold or used by producers:						
Dry salt:						
Evaporated (manufactured) short tons	1,725,528	3,249,457	3,158,718	3,207,403	3,284,361	3,329,288
Rock salt do	453,311	3,412,008	3,754,353	3,846,846	[2] 3,444,341	3,927,267
Total do	2,178,839	6,661,465	6,913,071	7,054,249	[2] 6,728,702	7,256,555
Value	(3)	$38,294,396	$43,032,621	$46,430,927	[2] $45,956,223	$51,795,728
Average per ton	(3)	$5.75	$6.22	$6.58	[2] $6.83	$7.14
In brine:						
Short tons	[4] 700,494	8,470,680	9,140,811	9,349,044	[2] 8,843,513	9,373,254
Value	(3)	$6,618,190	$9,159,067	$7,900,855	[2] $7,670,015	$8,115,615
Total salt:						
Short tons	2,879,333	15,132,145	16,053,882	16,403,293	[2] 15,572,215	16,629,809
Value [5]	$6,617,449	$44,912,586	$52,191,688	$54,331,782	[2] $53,626,238	$59,911,343
Imports for consumption:						
Short tons	201,733	4,253	[2] 1,909	5,621	6,309	7,869
Value	$676,332	$29,628	$22,893	$40,748	$60,605	$58,819
Exports:						
Short tons	9,433	223,426	[6] 188,307	387,601	359,776	190,377
Value	$86,414	$1,889,522	[6] $1,588,847	$5,930,170	$3,353,115	$1,776,062
Apparent consumption [7] short tons	3,071,633	14,912,972	[2][6] 15,771,005	16,021,313	[2] 15,218,748	16,447,301

[1] Includes Puerto Rico.
[2] Revised figure.
[3] Figures included in total value; separate figures not available.
[4] Includes a small quantity of evaporated salt.
[5] Values are f. o. b. mine or refinery and do not include cost of cooperage or containers.
[6] 96,479 short tons valued at $2,347,679, shipped under the U. S. Army Civilian Supply Program, is excluded from exports shown but is deducted from apparent consumption.
[7] Quantity sold or used by producers, plus imports, minus exports.

The 1950 total was an all-time high record. In midyear the effects of the Korean conflict reversed what appeared in the first part of 1950 to be the long-expected postwar leveling off of production, and the new record was attained despite strikes and labor difficulties encountered by some of the largest salt consumers.

Figure 1 shows the upturn in production in 1950 following the 1949 decline.

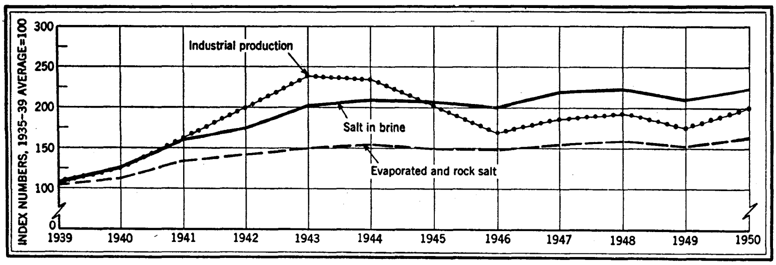

FIGURE 1.—Index of salt in brine and of evaporated and rock salt sold or used compared with industrial production, 1939–50. Index of industrial production from Federal Reserve Board.

The defense measures taken by the United States Government after the attack in Korea included many that affected the salt industry. Under the Defense Production Act of 1950, responsibility for salt production and consumption was assigned to the National Production Authority, which in turn delegated the production responsibility to the Defense Minerals Administration. Substantial expansion programs in some of the salt-consuming industries indicated continued growth in demand.

The Salt Producers Association formed a committee in 1950 to cooperate with the Government on problems affecting the industry and to assist members in obtaining necessary equipment and supplies. The monthly statistical reporting service instituted by the association a few years ago was discontinued in 1950.

PRODUCTION

PRODUCTION BY STATES

Slight changes occurred in the percentages of salt produced by the leading States; but the rank remained the same as for years past, with Michigan leading, followed by New York and Ohio. The three States together produced 59 percent of the total for the United States in 1950, as in 1949.

A number of changes and developments that occurred in the salt industry in 1950 follow.

California.—The City of San Jose, in 1950, instituted condemnation proceedings to acquire some of the salt ponds belonging to the Leslie Salt Co. as a site for the construction of a sewage-disposal plant. The company was reluctant to yield any of its ponds, however, and no decision had been reached by the end of 1950. The Leslie Salt Co. salt harvest was reduced approximately 100,000 tons by an unusually violent storm in November. The company, in the last few years especially, has exported large tonnages to Japan, but shipped none in 1950. The Long Beach Salt Co., Kern County, depends upon rain to flood the dry lake from which it obtains its salt; but in 1950, as in 1949, there was no rain and therefore no output. Beginning January 1, 1950, the Western Salt Co. leased the operations of the Irvine Co., at Tustin, for 10 years and produced solar salt from this tract as well as its other holdings.

TABLE 2.—Salt sold or used by producers in the United States, 1948–50, by States

State	1948			1949			1950		
	Quantity		Value	Quantity		Value	Quantity		Value
	Short tons	Percent of total		Short tons	Percent of total		Short tons	Percent of total	
California	914,035	6	$3,927,722	964,807	6	$4,110,271	868,496	5	$3,816,655
Kansas	831,756	5	4,960,828	[1] 832,442	5	[1] 5,217,844	846,374	5	5,914,514
Louisiana	2,223,249	13	6,444,751	2,030,076	13	5,837,714	2,278,811	14	6,902,502
Michigan	4,387,879	27	16,265,743	4,064,106	26	[1] 16,109,117	4,446,667	27	18,178,765
New York	3,065,831	19	13,056,542	2,951,750	19	[1] 12,709,819	2,806,927	17	14,405,362
Ohio	2,752,696	17	5,884,343	2,195,778	14	5,134,923	2,515,205	15	5,491,553
Puerto Rico	15,145	(2)	112,072	12,664	(2)	77,322	13,545	(2)	137,225
Texas	1,354,109	8	1,712,169	[1] 1,641,171	11	[1] 2,419,963	1,852,138	11	2,846,789
Utah	113,779	1	429,494	78,611	1	386,935	116,694	1	511,938
West Virginia	246,732	1	1,197,645	355,515	2	1,288,471	367,942	2	1,238,588
Other States [3]	498,082	3	340,473	445,295	3	333,859	517,010	3	467,452
Total	16,403,293	100	54,331,782	[1] 15,572,215	100	[1] 53,626,238	16,629,809	100	59,911,343

[1] Revised figure.
[2] Less than 0.5 percent.
[3] Includes Nevada, New Mexico, Oklahoma, and Virginia.

Kansas.—The Carey Salt Co. did not operate at Lyons in 1950, but sold some salt from stock.

Louisiana.—Equipment used in the Carey Salt Co. mine at Winnfield was described in a brief article.[1] In 1950 the Solvay Process Co. was reported to have sold its rock quarry near Winnfield, La., to the Carey Salt Co. "The property includes about 1,800 acres of land and a 100-foot railroad right-of-way into Winnfield, a distance of about 5 miles." The salt mine of the Carey Salt Co. is immediately under this tract, which heretofore was leased.[2]

Michigan.—Manistee Salt Works, Manistee, put down two new wells at its works in the latter part of 1950. These will increase its capacity to supply brine for evaporated salt. The Michigan Chemical Corp. formed a wholly-owned subsidiary, The Michigan Salt Co., as a sales organization and salt-distributing company. Aided by an RFC loan, the parent company expanded its salt operations, putting a new evaporating plant into operation by midsummer. The Pennsylvania Salt Co. discontinued production of byproduct salt at its Wyandotte plant on December 31, 1950. The plant of the Saginaw Salt Products Co. is being scrapped.

Nevada.—Leslie Salt Co. dry-lake operations at Fallon are still supplying a small quantity of (crude) solar salt for local consumers.

New York.—The West Shore Salt Co., a new company, began well operations at Ithaca late in 1950. The output of grainer salt was small, but it was expected that production would increase in 1951.

Ohio.—The Pomeroy Salt Corp. at Pomeroy was shut down temporarily in 1950 and operated less than 300 days. The International Salt Co. continued to search in Ohio for a suitable deposit for a salt mine to supply requirements in that area. In 1950 salt supplies were brought in from International's Detroit mine.

[1] Pit and Quarry, Modern Salt Equipment Employed in Salt Mine 881 Feet Down: Vol. 42, No. 7, January 1950, p. 68.
[2] Pit and Quarry, Solvay Process Sells Quarry to the Carey Salt Co.: Vol. 42, No. 12, June 1950, p. 53.

Texas.—The work of combining and expanding the salt-production facilities of the Morton Salt Co. at Grand Saline was completed and production started in mid-1950. The new refining installations were described in trade magazines.[3] The old rock-salt mine was closed for about 2 months, because it was deemed unsafe, before work was begun at Morton's new mine. The Gulf Salt Co., with wells at Missouri City, resumed operations in 1950. It was inactive 2 months because of a cave-in that occurred toward the end of 1949 after only a few weeks of operation. The caved area was filled in, a warehouse replaced, and other damage repaired.[4]

Utah.—The old buildings of the Morton Salt Co., at Saltair, destroyed in the latter part of 1949, were replaced by a modern plant that went into operation in 1950. The Stansbury Salt Co., Inc., at Stansbury Island, is a new operation. A drying, screening, and bagging plant was constructed in 1950 and went into production in the latter part of the year.

Virginia.—The Mathieson Chemical Corp. let a contract for the construction of a large modern plant at Saltville in which chlorine and caustic soda will be made from salt. The new plant is scheduled for operation by the third quarter of 1951. The old plant at Saltville continued production of salt brine for making soda ash.[5]

PRODUCTION BY METHODS OF RECOVERY

The quantities of salt produced by each of the basic methods of recovery are given in table 3. These methods are described in the Salt chapter of Minerals Yearbook, 1948.

TABLE 3.—Salt sold or used by producers in the United States, 1949–50, by method of recovery [1]

Method of recovery	1949 [2]		1950	
	Short tons	Value	Short tons	Value
Evaporated:				
Bulk:				
Open pans or grainers	456, 896	$6, 670, 998	468, 169	$7, 545, 403
Vacuum pans	1, 751, 576	16, 808, 001	1, 868, 804	18, 640, 894
Solar	807, 051	2, 974, 081	726, 480	2, 708, 065
Pressed blocks	268, 838	3, 270, 664	265, 835	3, 465, 935
Rock:				
Bulk	3, 381, 592	15, 629, 624	3, 864, 186	18, 730, 831
Pressed blocks	62, 749	602, 855	63, 081	704, 600
Salt in brine (sold or used as such)	8, 843, 513	7, 670, 015	9, 373, 254	8, 115, 615
Total	15, 572, 215	53, 626, 238	16, 629, 809	59, 911, 343

[1] Includes production in Puerto Rico.
[2] Revised figures.

[3] Chemical and Engineering News, New Morton Plant to Be Completed This Month: Vol. 28, No. 24, June 12, 1950, p. 2007.
Lee, James A., How Morton Refines Salt, Fights Corrosion, Handles Solids: Chem. Eng., vol. 58, No. 1, January 1951, pp. 102–105.
[4] Chemical and Engineering News, Gulf Salt Co. Resumes Operation: Vol. 28, No. 18, May 1, 1950, p. 1487.
[5] Chemical and Engineering News, Mathieson Hydrocarbon Awards Contract for Chlorine Plant: Vol. 28, No. 31, July 31, 1950, p. 2592.

A modification in the usual evaporation process was introduced in the new plant of the Michigan Chemical Corp. at St. Louis, Mich., which employs a type of forced-circulation evaporator new to the commercial salt industry. The advantages claimed are "increased capacity, better heat transfer, lower steam requirement, uniform crystal size, and easier maintenance." An article was published which describes in general the method adapted and includes an isometric drawing of the system.[6]

Evaporated Salt.—In 1950 evaporated salt was produced in 48 plants in 12 States and Puerto Rico. Of this total, 726,480 tons was solar salt; the remainder was produced by mechanical evaporation. Evaporated salt was 20 percent of total salt output.

TABLE 4.—Evaporated salt sold or used by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Kansas	321, 812	$3, 255, 070	334, 611	[1] $3, 616, 344	344, 751	$4, 066, 310
Louisiana	88, 304	991, 871	99, 725	886, 953	115, 308	1, 119, 300
Michigan	871, 226	9, 705, 533	873, 949	[1] 9, 904, 170	868, 349	10, 736, 781
New York	429, 870	5, 620, 727	417, 518	[1] 5, 535, 001	487, 245	6, 375, 966
Ohio	441, 169	4, 287, 147	445, 591	3, 976, 109	472, 966	4, 274, 738
Puerto Rico	15, 145	112, 072	12, 664	77, 322	13, 545	137, 225
Other States [2]	1, 039, 877	5, 487, 765	1, 100, 303	5, 727, 845	1, 027, 124	5, 649, 977
Total	3, 207, 403	29, 460, 185	3, 284, 361	[1] 29, 723, 744	3, 329, 288	32, 360, 297

[1] Revised figure.
[2] Includes California, Nevada, New Mexico, Oklahoma, Texas, Utah, and West Virginia.

Rock salt.—In 1950 rock-salt production amounted to 3,927,267 short tons. It was produced in 18 mines in 8 States. It comprised 24 percent of total salt output.

TABLE 5.—Rock salt sold by producers in the United States,[1] 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	3, 505, 740	$12, 964, 391	1948	3, 846, 846	$16, 970, 742
1946	3, 412, 008	13, 308, 001	1949 [2]	3, 444, 341	16, 232, 479
1947	3, 754, 353	15, 989, 680	1950	3, 927, 267	19, 435, 431

[1] There is no production of rock salt in Puerto Rico.
[2] Revised figures.

Pressed Blocks.—In 1950 production of pressed blocks totaled 328,916 short tons, including evaporated salt blocks from 22 plants in 8 States and rock-salt blocks from 8 plants in 3 States.

[6] Simmons, L. D., Something New in Salt Making: Chem. Eng., vol. 57, No. 11, November 1950, pp. 156—157.

TABLE 6.—Pressed-salt blocks sold by original producers of the salt in the United States,[1] 1946–50

Year	From evaporated salt		From rock salt		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	298, 314	$2, 942, 966	97, 060	$828, 412	395, 374	$3, 771, 378
1947	260, 399	2, 708, 857	69, 163	638, 958	329, 562	3, 347, 815
1948	274, 511	2, 933, 694	48, 830	459, 986	323, 341	3, 393, 680
1949	268, 838	[2] 3, 270, 664	[2] 62, 749	[2] 602, 855	[2] 331, 587	[2] 3, 873, 519
1950	265, 835	3, 465, 935	63, 081	704, 600	328, 916	4, 170. 535

[1] There is no production of pressed-salt blocks in Puerto Rico.
[2] Revised figure.

Brine.—In 1950 production of salt in brine totaled 9,373,254 tons. The output came from 17 operations in 7 States and constituted 56 percent of total output of all types of salt—virtually the same as in 1949.

SALT PRODUCTION, 1901–50

Half a century of production in the United States has yielded more than 400 million short tons of common salt. Salt is now used in many articles and chemicals that were unknown 50 years ago; the outstanding growth, however, has been in the use of salt as a raw material for chemical making.

All three types of salt have shared in the growth in requirements. (See fig. 2.) Production of evaporated salt increased from 1,725,528 tons in 1901 to 3,329,288 tons in 1950; rock salt from 453,311 tons to 3,927,267, and brine from about 700,000 tons to 9,373,254 tons. Pressed blocks were first made about 1917.

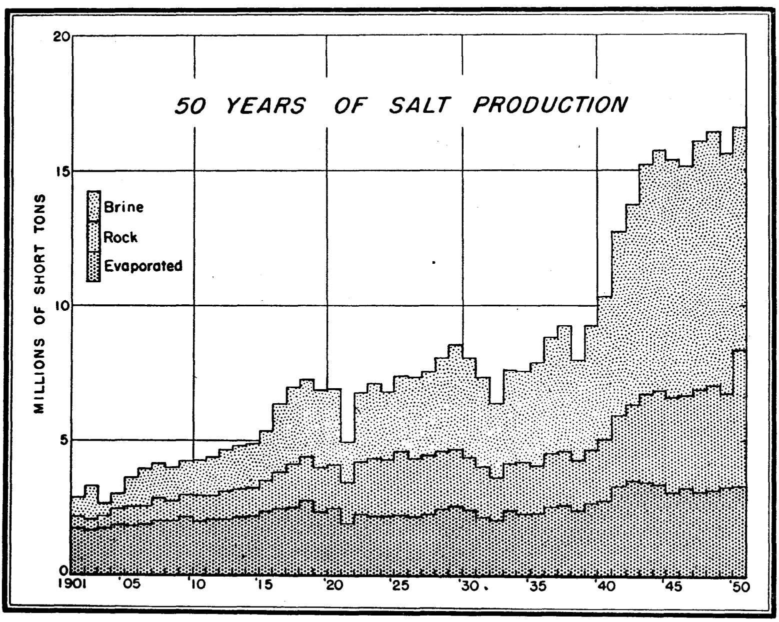

FIGURE 2.—Production of brine (salt content), rock salt, and evaporated salt, 1901–50.

The upward trend in salt production was accompanied by a downward trend in the number of plants providing the total output. The trend has been toward larger and fewer operations. Whereas in 1901 about 150 plants were producing, in 1950 there were less than half that number.

The 1950 salt production of 16,629,809 short tons was about a million tons more than was produced in the entire first 5 years of the century. Since 1897 the United States has been the largest salt-producing country.

CONSUMPTION AND USES

In 1950 the consumption of salt trended toward wartime uses, especially after the start of the Korean War in midyear. Thus increased quantities of salt were used for chlorine and soda-ash manufacture, for steel making and in other metallurgy, and for synthetic rubber manufacture. Chemicals made from salt required 67 percent of the total salt output in 1950.

It appeared in the first half of 1950 that chlorine production would attain a new peak (with 11-percent increase in the first 4 months of the year compared with the first 4 months of 1949), but a set-back was experienced in midyear because of strikes and other labor difficulties. Continuation of the strikes for many weeks resulted in short supplies of both chlorine and soda ash; however, following settlement plants were able to accelerate operations to such an extent that before the end of the year new records were registered in the quantity of salt consumed both in chlorine and in soda-ash production.

Further increases in consumption of salt for production of chlorine and soda ash, and of sodium metal, are indicated by expansion programs. In particular, the National Distillers Chemical Corp., Ashtabula, Ohio, is a potentially large user of salt for the production of chlorine and sodium. The company's new plant for making sodium metal, with a rated annual capacity of about 40,000,000 pounds, began shipping sodium in 1950. Further expansion of chlorine and caustic soda units on the west coast, started in the latter part of 1950, will call for increased quantities of salt from that area.

The consumption of salt in various uses is shown in table 7. The table contains a number of revisions for 1949, inasmuch as a better breakdown of the consumption for that year was obtained after publication of the 1949 Salt chapter.

Demand for salt for use in metallurgical industries increased when the defense program got under way. Salt and some of its derivatives are used in such metallurgical applications as descaling and heat treatment.[7]

Increased salt consumption was also reported for canning and preserving and in other food processing. The great increase in salt—especially rock salt—used for highways, railroads, and other dust and ice control in 1950 was due mainly to the severe winter.

The use of salt in soap and detergents increased in 1950. Soap and detergents are widely used in industry, as well as in the home. Salt has long been used in glazing tile, pipe, and other ceramic products.

[7] Munger, P. (in a symposium series), Chem. and Eng. News, vol. 29, No. 8, Feb. 19, 1951, pp. 647–649.

According to an article published in 1949, the use of salt in structural clay products manufacture was introduced at the turn of the century by Homer F. Staley, ceramist.[8]

Included under "Undistributed" in table 7 are several important uses. In addition to the chlorine so used, more than 50,000 tons of salt were employed directly in synthetic-rubber manufacture in 1950. About 35,000 tons went into paper and pulp making. State and Federal Governments bought a sizable quantity of salt in addition to that specifically identified as for use on highways. Smaller quantities were used for brick and tile, laundering and dry cleaning, pigment making, and tobacco.

TABLE 7.—Salt sold or used by producers in the United States, 1949–50, by classes and uses, in thousands of short tons

Use	1949 [1]				1950			
	Evaporated	Rock	Brine	Total	Evaporated	Rock	Brine	Total
Chlorine, bleaches, chlorates, etc.	367	681	2,388	3,436	419	739	2,731	3,889
Soda ash	(2)		6,237	[2] 6,237	(2)		6,379	[2] 6,379
Dyes and organic chemicals	55	58		113	68	81		149
Soap (precipitant)	44	11		55	53	11		64
Other chemicals	86	442	(3)	[3] 528	102	599	(3)	[3] 701
Textile processing	26	84		110	29	99	(3)	[3] 128
Hides and leather	91	139		230	112	143	(3)	[3] 255
Meat packing	340	379		719	339	376		715
Fish curing	32	13	(3)	[3] 45	34	12		46
Butter, cheese, and other dairy products	65	5		70	71	5		76
Canning and preserving	135	15		150	138	25		163
Other food processing	198	20		218	219	20		239
Refrigeration	50	146	(3)	[3] 196	54	128	(3)	[3] 182
Livestock, agriculture, and general farm use [4]	613	251		864	670	286		956
Highways, railroads and other dust and ice control	8	404		412	12	554		566
Table and other household use	502	131		633	527	95		622
Water treatment	260	264	(3)	[3] 524	278	270	(3)	[3] 548
Metallurgy	19	51		70	28	65		93
Undistributed [5]	393	350	219	962	177	419	263	859
Total	3,284	3,444	8,844	15,572	3,330	3,927	9,373	16,630

[1] Revised figures.
[2] Data for evaporated salt included with "Undistributed," in order to avoid disclosure of individual company operations.
[3] Data for salt in brine included with "Undistributed," in order to avoid disclosure of individual company operations.
[4] Livestock salt is about 90 percent of the total.
[5] Comprises miscellaneous uses and uses for which data may not be shown separately (see footnotes 2 and 3); also includes some exports and consumption in Territories and possessions.

One of the processes used for removing sulfur from coke-oven gas is absorption of sulfides by a sodium carbonate solution, but no figures on the quantity of salt so used are available.

Total salt consumed for food preparation and preservation increased. Details by areas on this use are not generally available; but it has been estimated that northern California consumes 6,500 tons of salt and 1,500 tons of caustic soda in food processing annually.[9]

[8] Cox, Paul E., A Salty Story: Ceram. Age, vol. 53, No. 1, January 1949, p. 26.
[9] California Journal of Mines and Geology, Food Processing: Vol. 46, No. 3, July 1950, p. 384.

Geographical Distribution.—Primary shipments of salt to the various States by the producers of the salt are shown in table 8. The table does not take into account reshipments, and because of this it gives only an approximation of the actual distribution of eventual consumption; however, this is the only available measure of consumption by States.

TABLE 8.—Distribution (shipments) of evaporated and rock salt in the United States, 1949–50, by States of destination, in short tons

Destination	1949		1950	
	Evaporated	Rock	Evaporated	Rock
Alabama	15,647	94,788	17,172	99,387
Arizona	18,760	[1] 2,483	19,198	2,239
Arkansas	11,170	[1] 40,710	12,918	56,939
California	369,225	63,227	408,418	53,927
Colorado	33,812	[1] 23,776	42,311	27,650
Connecticut	13,429	14,903	14,172	19,104
Delaware	5,875	12,551	5,030	10,257
District of Columbia	5,368	2,059	5,642	1,730
Florida	10,804	28,560	10,906	33,340
Georgia	24,652	41,054	23,572	49,582
Idaho	16,543	1,426	17,948	2,484
Illinois	231,529	[1] 247,154	231,858	277,045
Indiana	105,186	62,068	113,567	75,277
Iowa	108,181	[1] 105,903	113,400	99,597
Kansas	52,743	[1] 174,475	54,398	191,770
Kentucky	32,673	58,083	36,373	73,712
Louisiana	13,943	64,010	16,357	121,596
Maine	11,715	60,544	11,846	59,060
Maryland	36,262	60,259	38,347	71,285
Massachusetts	54,446	70,199	60,350	95,163
Michigan	115,782	121,265	115,548	176,054
Minnesota	118,188	[1] 76,928	118,087	74,217
Mississippi	9,933	25,764	10,864	25,589
Missouri	76,532	[1] 69,484	77,207	63,769
Montana	18,181	2,483	21,502	1,306
Nebraska	54,895	[1] 66,090	58,365	66,246
Nevada	7,325	57,054	6,748	86,093
New Hampshire	4,595	58,899	5,397	68,554
New Jersey	101,507	139,183	120,293	142,785
New Mexico	9,501	[1] 21,699	10,195	23,054
New York	194,196	[1] 570,979	220,557	613,067
North Carolina	52,927	65,175	51,943	71,740
North Dakota	11,814	[1] 1,191	12,213	4,423
Ohio	193,744	127,302	203,993	218,315
Oklahoma	29,569	[1] 22,566	31,145	19,815
Oregon	73,751	401	60,167	523
Pennsylvania	129,659	108,985	136,306	121,886
Rhode Island	8,793	11,378	8,966	12,928
South Carolina	12,427	18,281	12,776	19,854
South Dakota	20,440	[1] 14,291	20,291	14,145
Tennessee	33,117	[1] 65,563	35,567	73,081
Texas	46,995	[1] 200,596	60,403	207,140
Utah	23,114	1,863	23,421	1,672
Vermont	6,432	24,929	7,067	27,627
Virginia	55,162	89,406	61,841	93,487
Washington	174,098	1,052	216,348	340
West Virginia	162,043	62,089	155,128	72,874
Wisconsin	128,073	44,311	134,112	47,039
Wyoming	8,886	[1] 3,433	10,515	2,987
Other [2]	230,719	[1] 143,469	68,540	155,513
Total	3,284,361	[1] 3,444,341	3,329,288	3,927,267

[1] Revised figure.
[2] Includes shipments to Territories and possessions of the United States, exports, and some shipments to unspecified destinations.

TABLE 9.—Salt shipped to United States possessions,[1] 1948–50

[U. S. Department of Commerce]

Possession [1]	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
American Samoa	1	$53	20	$821	1	$127
Guam	98	4,202	51	3,556	103	5,740
Puerto Rico	7,000	407,883	6,651	397,918	9,822	640,277
Virgin Islands	41	2,669	36	2,688	39	3,766
Total	7,140	414,807	6,758	404,983	9,965	649,910

[1] Salt is also shipped to the Territories of Alaska and Hawaii, but no record has been kept of these shipments since March 1948.

PRICES

Prices quoted by the Oil, Paint and Drug Reporter for salt at New York City opened at the same levels as at the end of 1949, but changed during the latter part of the year as shown in table 10.

TABLE 10.—Price of bagged salt, delivered New York, Jan. 1 and Dec. 31, 1950, per 100 pounds

[Oil, Paint and Drug Reporter]

	Jan. 1, 1950	Dec. 31, 1950
Rock salt:		
Paper bags, carlots	$0.88	$0.94
Burlap bags, carlots	.98	1.09
Paper bags, less than carlots	1.09–1.12	1.15
Burlap bags, less than carlots	1.19–1.22	1.30
Table, vacuum common fine, bags:		
Carlots, works	.98–1.08	1.09
Less than carlots (delivered)	1.20–1.32	1.20

FOREIGN TRADE [10]

In 1950 imports increased more than 1,500 short tons, whereas exports decreased about 170,000 tons. In the text that follows the highlights of import and export developments over the past 50 years are noted. It was during this period that the United States changed from a salt-importing to a salt-exporting country. Previous to 1917 the United States commonly imported more salt than it exported.

Imports.—In 1901 salt imports totaled 201,733 short tons valued at $676,332 compared with 7,869 tons valued at $58,819 in 1950. Great Britain was our principal supplier in 1901, with about 40 percent of the total, followed by the West Indies (chiefly British) and Italy. From all other countries salt imports were small. In recent years our chief imports of salt have been from Canada.

[10] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 11.—Salt imported for consumption in the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	1949		1950	
	Short tons	Value	Short tons	Value
Bahamas			65	$180
Canada	3,264	$48,630	4,284	48,507
Jamaica	3,045	11,975	3,439	9,380
Netherlands Antilles			80	688
United Kingdom			1	64
Total	6,309	60,605	7,869	58,819

An outstanding modification of the salt import pattern has been the drop in importation of salt for fish curing. In 1901 salt imported for this purpose totaled 57,629 tons, and for many years it continued to be a large part of the total salt imports. Even until just before World War II, fish salt was the principal type imported. In 1942, however, it shrank to about 6,300 tons, and in 1943, for the first time in 80 years, the type disappeared entirely from the list of salt imports. Except for 1946 and a little in 1948, none has been imported since.

TABLE 12.—Salt imported for consumption in the United States, 1946–50, by classes

[U. S. Department of Commerce]

Year	In bags, sacks, barrels, or other packages (dutiable) [1]		Bulk			
			Dutiable		Free (used in curing fish)	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	275	$4,456	2,571	$20,161	1,407	$5,011
1947	[2] 376	8,571	1,533	14,322		
1948	1,591	20,971	3,262	17,033	768	2,744
1949	2,851	40,308	3,458	20,297		
1950	3,395	43,567	4,474	15,252		

[1] Includes 2,000 pounds valued at $20 imported free in 1946.
[2] Revised figure.

Exports.—Whereas in 1901 salt exports from the United States were only 9,433 tons valued at $86,414, in 1950 they totaled 190,377 tons valued at $1,776,062. The record year for exports of salt was 1948, when 387,601 tons was shipped out of the country. At the beginning of the century, our salt exports were chiefly to Asiatic Russia, Canada (about 40 percent), Japan, and Mexico. The distribution in 1949–50 is shown in table 13. Salt exports to Canada in 1950 were 89 percent of the total.

TABLE 13.—Salt exported from the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	1949 Short tons	1949 Value	1950 Short tons	1950 Value
North America:				
Bermuda	11	$766	17	$920
Canada including Newfoundland and Labrador	151,328	1,115,510	169,275	1,255,998
Central America:				
British Honduras	262	9,554		
Canal Zone	710	35,159	732	36,465
Costa Rica	123	2,474	54	7,220
Guatemala	2,565	41,190	202	4,790
Honduras	298	8,226	148	4,225
Nicaragua	374	9,211	483	12,509
Panama	252	8,243	246	8,940
Mexico	7,267	164,689	5,443	122,357
West Indies:				
British:				
Jamaica	5	125		
Other British	32	558	1	109
Cuba	9,095	191,534	10,299	214,962
Dominican Republic	99	6,411	139	9,505
Haiti	13	1,218	15	992
Netherlands Antilles	249	15,350	330	17,332
Other North America	111	2,122	90	2,348
South America:				
Argentina	1	222	9	1,190
Bolivia	24	857		
Brazil	55	3,339	(1)	216
Chile	2	446	(1)	101
Uruguay	5	1,345	10	1,676
Venezuela	15	2,320	4	2,374
Other South America	3	529	6	994
Europe:				
Austria			2	455
France			3	100
Greece	1	108		
Iceland	1	168		
Asia:				
Hong Kong	83	2,309	1	330
Indonesia	19	1,990	1	187
Japan	131,304	986,992	29	2,003
Korea	51,558	596,169		
Pakistan	30	6,898	(1)	1,150
Philippines	2,320	70,694	2,741	58,343
Saudi Arabia	110	5,549	51	5,241
Other Asia	35	2,010	3	262
Africa:				
Belgian Congo	23	1,286	27	1,502
Liberia	1,087	48,707		
Other Africa	13	883	9	858
Oceania:				
French Pacific Islands	263	6,761	7	408
New Zealand	10	254		
Other Oceania	20	939		
Total	359,776	3,353,115	190,377	1,776,062

[1] Less than 0.5 ton.

TECHNOLOGY

A new model of the Lixator—the International Salt Co. rock-salt dissolver—appeared on the market in 1949. It is made of stainless steel and has certain improvements that facilitate its use. It supplies saturated brine for many industrial uses.

A new special salt, in which 1 pound of a special compound is blended with 100 pounds of salt in a stainless-steel rolling drum, is reported to be more efficient in preventing fat rancidity in prepared food products.[11]

[11] Chemical Industries, Tenoxized Salt, vol. 66, No. 3, March 1950, p. 349.

A calorimetric method for determination of minimal quantities of iodine in iodized table salt was described.[12]

A chemical method for removing salt-deposit scale on distilling units aboard ship was developed by the Naval Engineering Experiment Station.[13]

So that more salt may be used effectively for de-icing streets and highways in winter, with less damage to automobiles because of rusting of fenders and other parts, a chemical that appeared on the market 2 years ago for other purposes has been adapted to salt mixtures.[14] The special mixture, which was previously purchasable separately only, can now be bought premixed with salt.[15] When the chemical is bought separately it is mixed in small quantities (1 percent) with the de-icing salt.

WORLD PRODUCTION

In most of the salt-producing countries of the world output increased in 1950 over 1949. The few decreases were moderate. The record of the past 50 years is also one of increased salt output for most countries. Food-salt requirements are greater, owing to the increase in world population, and industrial uses have also risen.

All tonnages mentioned in this world production section, unless otherwise stated, are metric.

TABLE 14.—World production of salt, 1945–50, by countries,[1] in metric tons
[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
North America:						
Canada	608, 261	486, 781	672, 697	672, 457	680, 137	725, 655
Costa Rica	6, 033	8, 000	6, 252	6, 500	8, 200	8, 400
Guatemala	(2)	(2)	(2)	11, 474	11, 962	11, 340
Honduras	900	859	726	1, 089	(2)	(2)
Mexico	130, 380	131, 972	122, 235	[3] 156, 685	(2)	(2)
Nicaragua	[3] 6, 000	[3] 6, 000	7, 503	[3] 9, 475	[3] 10, 230	11, 172
Panama	2, 437	7, 958	4, 412	3, 374	3, 408	[3] 5, 650
Salvador	18, 004	22, 680	16, 483	21, 213	[3] 25, 000	(2)
United States:						
Rock salt	3, 180, 337	3, 095, 305	3, 405, 874	3, 489, 782	3, 124, 637	3, 562, 738
Other salt	10, 784, 920	10, 632, 274	11, 157, 887	11, 390, 957	11, 002, 165	11, 523, 492
West Indies:						
British:						
Bahamas	38, 825	36, 580	60, 960	63. 000	60, 960	60, 960
Turks and Caicos Islands	21. 229	31, 571	----------	38. 610	61, 765	(2)
Cuba	52, 335	56, 782	51, 225	55, 339	59, 874	59, 266
Dominican Republic:						
Rock salt	(2)	2, 776	2, 084	2, 365	2, 412	2, 304
Other salt	15, 000	15, 746	14, 918	13, 079	8, 140	13, 740
Haiti [3]	8, 000	8, 000	8, 000	8, 000	8. 000	(2)
Netherlands Antilles	3, 109	2, 017	217	482	370	3, 000
South America:						
Argentina:						
Rock salt	3, 275	(2)	(2)	(2)	(2)	(2)
Other salt	433. 116	384, 000	384, 000	(2)	(2)	(2)
Brazil	430, 163	609. 198	562, 570	781, 378	800, 872	(2)
Chile:						
Rock salt	47, 136	52, 093	54, 289	47, 164	35, 079	46, 709
Other salt [3]	30, 655	31, 033	28, 001	30, 804	4, 450	942
Colombia	105, 072	124, 367	121, 247	124, 081	125, 920	141, 019
Ecuador	27, 600	35, 070	29, 400	25, 110	16, 833	34, 902
Peru	55, 143	56, 615	60, 108	63, 049	55, 986	(2)
Venezuela	57, 459	90, 555	35, 794	35, 533	71, 926	(2)

For footnotes, see end of table.

[12] Rogina, B., and Urch-Horvat, M., Determination of Small Amounts of Iodine in Iodized Table Salt: British Abs., part 5, C-3, May 1950, p. 186.
[13] Chemical and Engineering News, Removal of Salt Deposit: Vol. 28, No. 4, Jan. 23, 1950, p. 277.
[14] Chemical Industries, Non-Corrosive De-Icer; vol. 66, No. 1, January 1950, pp. 72–74.
[15] Chemical and Engineering News, vol. 27, No. 50, Dec. 12, 1949, p. 3740.

TABLE 14.—World production of salt, 1945–50, by countries,[1] in metric tons—Con.

Country [1]	1945	1946	1947	1948	1949	1950
Europe:						
Austria:						
Rock salt	100	554	4,348	1,752	719	1,085
Other salt	82,648	168,150	183,764	197,615	229,423	236,532
Bulgaria:						
Rock salt	([2])	13,659	([2])	[3] 120,000	([2])	([2])
Other salt	([2])	([2])	([2])			
Czechoslovakia [4]	4,235	9,232	([2])	([2])	([2])	([2])
France:						
Rock salt and salt from springs	642,378	1,514,470	2,148,140	2,489,036	([2])	([2])
Other salt	514,038	476,750	467,410	446,539	[3] 676,000	([2])
Germany: Federal Republic	([2])	1,619,112	1,825,062	2,035,694	1,800,000	2,470,000
Greece	90,000	105,000	51,000	52,208	([2])	([2])
Italy:						
Rock salt	153,256	447,519	720,790	712,608	814,420	([2])
Other salt	995,103	792,844	668,900	([2])	([2])	
Malta	3,350	1,402	1,631	1,869	1,807	1,827
Netherlands	53,600	180,241	240,579	250,417	331,000	412,570
Poland	[5] 144,665	280,099	619,770	725,774	800,000	([2])
Portugal:						
Rock salt	71	46	69	49	([2])	([2])
Other salt [6]	7,769	82,974	25,071	10,660	([2])	30,765
Rumania: Rock salt	277,183	345,000	314,485	([2])	([2])	([2])
Spain:						
Rock salt	228,029	262,651	265,248	292,881	288,896	313,676
Other salt	562,453	510,121	569,343	696,600	546,886	([2])
Switzerland	82,657	92,089	107,757	112,218	[3] 100,000	94,000
United Kingdom:						
Great Britain:						
Rock salt	17,062	20,819	40,639	41,000	[3] 41,400	([2])
Other salt	3,268,083	3,385,540	3,148,639	3,794,000	[3] 3,740,000	([2])
Northern Ireland	12,679	13,474	12,603	13,245	12,973	([2])
Yugoslavia	([2])	113,200	111,200	102,300	[3] 108,900	([2])
Asia:						
Aden	142,191	114,856	197,672	275,408	308,302	259,972
Burma	([2])	44,621	52,566	44,880	31,692	([2])
Ceylon	42,364	43,666	23,231	78,300	28,780	66,093
China [3]	1,900,000	1,683,000	2,007,000	2,480,000	2,000,000	2,500,000
Formosa	[3] 100,000	191,850	[3] 250,000	[3] 360,000	250,000	[3] 160,600
Cyprus	----------	[7] 3,429	15,622	----------	----------	([2])
India:						
Rock salt	256,366	266,447	4,605	4,123	4,229	([2])
Other salt	1,974,788	2,235,390	1,560,471	2,300,882	2,022,060	2,657,929
Indochina	100,983	[8] 14,735	41,556	64,000	113,600	[3] 89,600
Indonesia	130,452	80,000	12,000	360,000	320,000	([2])
Iran	([2])	([2])	[9] 6,000	([2])	([2])	([2])
Iraq:						
Rock salt	2,521	9,512	12,365	14,000	8,989	12,000
Other salt	12,364					
Israel-Jordan:						
Rock salt	2,144	1,571	2,454	([2])	([2])	([2])
Other salt	16,350	23,163	12,567	8,302	6,500	
Japan	[10] 203,288	[10] 358,946	247,466	339,668	395,676	418,144
Korea	[3] 63,200	[3] 152,000	[3] 131,000	[11] 89,979	[11] 188,812	([2])
Lebanon	6,959	([2])	([2])	[3] 5,080	([2])	([2])
Pakistan:						
Rock salt	([12])	([12])	201,290	154,060	175,162	([2])
Other salt	([12])	([12])	217,755	184,625	205,318	([2])
Philippine Islands	([2])	([2])	([2])	([2])	20,000	56,283
Portuguese India	[6] 9,146	[6] 15,428	20,321	[6] 10,719	18,132	17,608
Syria	[3] 12,000	[3] 34,000	20,728	[3] 30,000	[3] 26,000	[3] 20,240
Thailand	41,393	137,601	([2])	([2])	([2])	([2])
Turkey:						
Rock salt	16,193	20,215	26,978	28,187	316,344	305,000
Other salt	255,303	186,088	249,865	238,755		
Africa:						
Algeria	49,969	66,570	75,680	73,038	101,676	([2])
Anglo-Egyptian Sudan	44,471	40,982	36,992	36,238	[3] 43,700	([2])
Angola	49,552	61,657	38,783	53,423	41,286	40,473
Belgian Congo	[3] 900	[3] 900	[3] 900	[3] 1,000	[3] 1,000	([2])
Canary Islands	16,302	13,659	6,956	13,209	([2])	([2])
Cape Verde Islands	7,886	14,376	9,246	13,632	([2])	([2])
Egypt	[6] 255,107	[6] 226,090	[6] 622,629	[6] 359,823	349,878	567,448
Eritrea	27,056	40,967	45,722	60,963	85,760	([2])
Ethiopia: Rock salt [3]	10,000	10,000	10,000	10,000	([2])	([2])
French Morocco:						
Rock salt	31,730	8,570	10,480	15,566	34,100	60,000
Other salt		40,975	34,095	([2])	([2])	([2])
French Somaliland	55,000	45,000	48,000	60,000	60,000	55,000

For footnotes, see end of table.

TABLE 14.—World production of salt, 1945–50, by countries,[1] in metric tons—Con.

Country [1]	1945	1946	1947	1948	1949	1950
Africa—Continued						
French West Africa	[3] 55,000	[3] 55,000	[3] 50,000	[3] 50,000	50,000	66,000
Italian Somaliland (formerly)	(2)	114	715	(2)	3,000	1,500
Kenya	15,491	15,635	14,058	16,813	18,820	18,722
Libya:						
Cyrenaica	(2)	700	200	140	[3] 500	(2)
Tripolitania		2,350	3,000	6,000	[3] 6,000	[3] 9,000
Mauritius	3,008	3,165	3,991	3,404	(2)	(2)
Mozambique	5,815	7,210	8,663	10,100	11,004	(2)
South-West Africa:						
Rock salt	3,238	3,533	2,788	4,436	2,468	3,471
Other salt	10,011	10,590	9,861	10,414	13,730	14,303
Spanish Morocco [3]	254	254	254	254	10	(2)
Tanganyika	9,502	13,373	10,837	12,073	[3] 15,200	14,152
Tunisia	61,289	93,400	114,790	98,029	98,085	(2)
Uganda	(2)	5,679	7,003	7,011	(2)	7,413
Union of South Africa	[13] 140,491	[13] 143,677	(2)	[3] 172,000	(2)	116,236
Australia:						
South Australia	173,813	160,753	157,563	175,865	171,154	(2)
Australia, other	(2)	(2)	(2)	88,308	77,778	(2)
Total [14]	36,000,000	38,335,000	40,500,000	44,400,000	43,600,000	48,000,000

[1] In addition to the countries listed, salt is produced in Afghanistan, Albania, Bolivia, British Somaliland, French Equatorial Africa, Gold Coast, Hungary, Leeward Islands, Madagascar, Nigeria, Southern Rhodesia, Sweden, and U. S. S. R., but figures of production are not available. Russian production is known to exceed 4,000,000 metric tons annually. Estimates by senior author of chapter included in the total.
[2] Data not available; estimates by author of the chapter included in total.
[3] Estimate.
[4] Excludes Sub-Carpathia, ceded to Hungary and U. S. S. R.
[5] April to December, inclusive.
[6] Exports.
[7] Incomplete data.
[8] Cochin-China only.
[9] Fiscal year ended Mar. 20 of year following that stated.
[10] Fiscal year ended Mar. 31 of year following that stated.
[11] South Korea only.
[12] Included under India.
[13] Fiscal year ended June 30 of year stated.
[14] Estimated by senior author of chapter.

NORTH AND CENTRAL AMERICA

Canada.—Canada has increased its production and expanded its markets for salt greatly in the past half century. In 1901 Canada produced about 54,000 metric tons, which rose to more than 725,000 tons in 1950. At present, efforts are being made to expand chlorine facilities, especially in Ontario, and this will require additional supplies of salt. Increases in 1950 over 1949 occurred in salt for both retail market and chemicals.

Dominican Republic.—The Government of the Dominican Republic assisted development of its salt industry in 1950 by floating a bond issue to provide capital for purchasing mining machinery and equipment. Also, new docks and warehouses will facilitate export shipments of salt.

SOUTH AMERICA

Uruguay.—In mid-1950 a solar salt project in Uruguay was 80 percent complete and impounding of sea water was expected to begin in November 1950. Heretofore, Uruguay has imported most of the salt it consumed.

Venezuela.—In September 1950 the Venezuelan Development Corp. started a study to determine the feasibility of establishing a plant in Venezuela to produce chlorine and its derivatives. A chemical analysis of the marine salt from Araya Peninsula was made.[16]

[16] Bureau of Mines, Mineral Trade Notes, vol. 31, No. 6, December 1950, pp. 34–35.

EUROPE

Austria and Hungary.—Austria in 1901 produced about 333,000 tons of salt, and Hungary produced about 184,000 tons. At present, Hungary produces only a negligible quantity whereas Austria maintains a fair proportion of its former output (about 237,000 tons in 1950).

France.—France produced 910,000 tons of salt in 1901, whereas the country now produces well over 2,000,000, approaching 3,000,000 tons in some years. The 1950 output figure is not available but presumably was much higher than for 1949.

Germany.—Germany produced 1,564,000 tons in 1901 (1,700,000 tons in 1925), and the Federal Republic of Germany (western Germany) produced 2,470,000 tons in 1950. During 1950 the Republic was able to increase its output considerably by reopening old salt pits in western Germany that were closed in 1919 to avoid overcompetition. Increased demand for salt by the chemical industries was the principal factor in augmenting the 1950 output.

Italy.—Italy produced 435,000 tons of salt in 1901 and now, commonly attains 1,000,000 tons or more a year.

Netherlands.—The salt works at Boekelo, slated to close early in 1950 because of high costs, were to have been transferred to Hengelo. However, because of increased demand and higher prices, they were kept active and produced 30,000 tons during the year. Netherlands attained an all-time peak of 412,570 tons in 1950, a substantial increase over 1949, owing chiefly to expanded and improved equipment at Hengelo, where 23 wells were in operation.

Spain.—Spain, which had a total output of 345,000 tons in 1901, now is approaching 1,000,000 tons annually.

Sweden.—During the first half of 1949, the Swedish Board of Trade reported that new salt deposits had been found near Trelleborg. It stated that two wells about 1,200 meters deep were expected to produce 100 cubic meters of brine per hour.[17]

United Kingdom.—The United Kingdom's output in 1901 totaled 1,812,000 tons; in 1950 it was around 4,000,000 tons. In March 1950 the Food Standards Committee of the Ministry of Food of the United Kingdom recommended that all prepacked free-running salt be required to contain iodide in amounts equivalent to not less than 15 and not more than 30 parts of iodine per million parts of salt and that, within 2 years of the date of the order, a similar requirement would apply to all other prepacked salt. It is understood that lack of proper packing materials was hindering production. Data for 1950 are not yet available, but in 1949 the statistics of commercial salt output by types were: Vacuum salt 545,913 tons, open-pan 378,417 tons, and rock salt 40,642 tons. A new chemical and salt works was built at Tetton, Cheshire.

Yugoslavia.—Yugoslavia planned in 1950 to increase its output so as to eliminate salt imports entirely. This can be done when the salt mines at Tusanji, near Tuzla, are opened. The Kreka salt mines cannot supply enough, and production costs are high. A kilogram of coal is required to produce a kilogram of salt. The Tuzla area is said to have large salt reserves, and within 10 years Yugoslavia plans to mine 300,000 tons of salt annually in the area.

[17] Chemical Age, vol. 60, No. 1548, Mar. 12, 1949, p. 403.

ASIA

Aden.—Aden produced 89,000 tons of solar salt in 1901 compared with 260,000 tons in 1950. A report on the salt industry of Aden described at length the four solar salt operations.[18] The output by these companies is exported to obtain foreign exchange and shipped chiefly to India and Japan. The Arab producers supply local demand. Packaged salt is imported.

Afghanistan.—Afghanistan's production of salt ranges from 35,000 to 100,000 tons annually and is consumed in the country. The salt is mined largely at Talaquan, Kataghan, and several salt lakes. The revenue acquired by the tax on salt production (8 million afghanis in 1950) is allocated to the Ministry of Mines for mineral development. In 1950 a leading mining engineer and official of Afghanistan visited various mining operations in the United States to observe American methods in the interest of improving exploitation in his own country. In addition to the recorded output, there is an unknown production by the native tribes, which satisfy their own salt requirements, and some salt is believed to be smuggled in.

India and Pakistan.—British India in 1901 produced 1,120,000 tons of salt. The equivalent area in 1950 produced more than 2,500,000 tons. At a meeting of the Central Salt Advisory Committee at New Delhi in January 1950 the committee recommended that no salt be imported in 1950. It was not possible, however, to attain the 200,000-ton increase in production in 1950 required to make the country self-sufficient. Imports have been mostly from Aden, with some from Italy and Spain. At the same time, however, India exported about 19,000 tons of salt to Japan compared with 7,000 tons in 1949. The committee felt that the current zonal system of salt distribution which is under the control at present of the respective Indian Governments, should continue.

It was reported that a model salt works was being laid out in the vicinity of the city of Bombay, with a research station and laboratory attached.[19] Also, the Government of West Bengal engaged technicians of a French salt-manufacturing concern to survey the Contai seaboard for the establishment of a large-scale factory.

In mid-July 1950, the Governments of India and Pakistan agreed to allow, effective immediately, imports of rock salt from Pakistan into India without any licensing or payment restrictions. The total annual output from Pakistan now averages 200,000 tons.

In 1950 the Pakistan Government considered a 5-year plan for development of a salt industry in the Province of East Pakistan, including establishment of new coastal sites for recovery from sea water and encouragement of cottage workers to increase output. Pakistan's salt sources were described in a Pakistan Government publication, "Mining Industry in Pakistan," reviewed in late 1950.[20]

Japan.—Japan produced 659,000 tons of solar salt in 1901 compared with 418,000 tons in 1950. During the half century, Japan worked deposits in North China and leased lands in the Kwantung Peninsula, which it lost in World War II. At present Japan is seeking foreign sources of cheap salt for its industries, as its own output is obtained by

[18] Bureau of Mines, Mineral Trade Notes, vol. 31, No. 4, October 1950, p. 42.
[19] Chemical Age, vol. 62, No. 1608, May 6, 1950, p. 697.
[20] Bureau of Mines, Mineral Trade Notes, vol. 31, No. 4, October 1950, p. 42.

necessarily costly processes. This is of particular importance because of the endeavor to restore the chemical industries in Japan to their former footing. Many obstacles were encountered in efforts to import salt in 1950, chief of which was transportation. This was especially true in the latter half of 1950 after the Korean trouble started. Although salt could be obtained from a number of countries at satisfactory f. o. b. prices, the lack of, or high cost of, shipping prohibited transactions. United States exports of salt to Japan were relatively small compared with 1949, as were also those from Italy and Spain.

Saudi Arabia.—A 5-year marketing contract by which Saudi Arabia would supply salt valued at $250,000 to Japan annually, was canceled before any salt was mined or shipped. It was planned to obtain the salt from the vicinity of Jizan, south Tihama, a short distance from the sea.

Turkey.—The United States Economic Cooperation Administration in 1949 approved a project to give technical assistance to the Government of Turkey to expand and modernize the salt industry of the country. American engineers completed a technical report in 1950, and two of the largest salt-producing plants were slated for improvements. It is expected that, when modernization is completed, annual production will be increased to 440,000 tons. During 1950 the Monopolies Administration placed orders in Germany under 1949–50 European Payments Agreement drawing rights for equipment to be installed at the salt mines of Camalti and Yavsan.

AFRICA

Algeria.—Algeria produced 19,000 tons of salt in 1901; in 1950 the figure was around 100,000 tons.

Egypt.—Egypt's output of salt in 1901 is not known, but in 1905 it was 37,000 tons; in 1950 more than half a million tons were produced. Salt exports from Egypt declined in 1950 after unusually large shipments in 1949 when a target figure of more than 444,000 tons was attained. Annual output now usually ranges from 500,000 to 600,000 tons, of which 250,000 to 300,000 tons are consumed locally and the remainder exported.

South Africa.—Salt and magnesium production from sea water began at a plant on the Cape West Coast in South Africa. Salt is collected by scrapers, dried, crushed, and graded.[21]

Tunisia.—From about 20,000 tons in 1901, output in 1950 had increased to about 100,000 tons a year. In 1950 the salt plant at Monastir announced the beginning of work on another 1,500 hectares of evaporation fields. Total production of the plant is expected to exceed 150,000 tons per year when expansion is completed.

OCEANIA

Australia.—Australia, which in 1901 produced 43,000 tons, now produces nearly 200,000 tons.

New Zealand.—Although more than 16,000 tons of salt had crystallized at the Lake Grassmere solar salt works in New Zealand, according to the press in March 1950, none was expected to be harvested during the year.

[21] Chemical and Engineering News, vol. 28, No. 5, Jan. 30, 1950, p. 338.

Sand and Gravel

By Henry P. Chandler and G. E. Tucker

GENERAL SUMMARY

THE YEAR 1950 was one of record production for the sand and gravel industry in the United States. The combined tonnage of these commodities increased 16 percent and the value 19 percent over the previous year, the dollar value of this industry in 1950 approaching the 300-million mark.

All classifications of sand and gravel, except railroad ballast, gained in tonnage over 1949. Under the heading of commercial operations, increases in tonnage were particularly noticeable in building and paving sand and in building gravel, while in the Government-and-contractor operations large tonnage increases were reported under paving sand and paving gravel. The output of sand was 37 percent and that of gravel 63 percent of the combined domestic production of these commodities during 1950.

In this chapter the terms "production" and "sales" are used interchangeably, inasmuch as stocks of sand and gravel are relatively small and fairly constant from year to year.

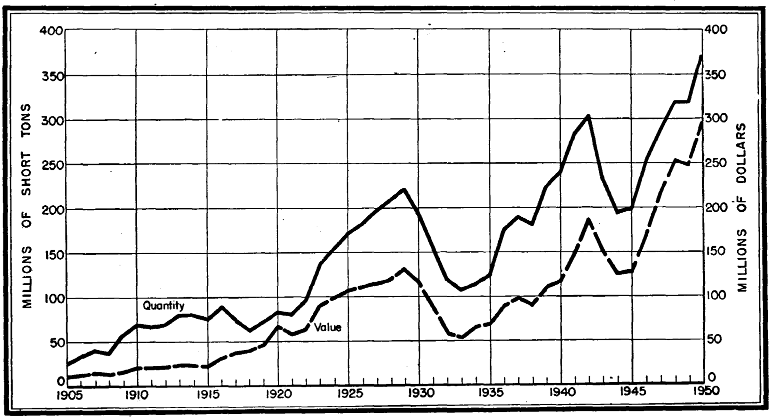

FIGURE 1.—Production of sand and gravel in the United States, 1905–50.

232294—53——69

TABLE 1.—Sand and gravel sold or used by producers in the United States,[1] 1949–50, by commercial and Government-and-contractor operations and by uses

	1949			1950			Percent of change in—	
	Short tons	Value		Short tons	Value		Tonnage	Average value
		Total	Average		Total	Average		
COMMERCIAL OPERATIONS								
Sand:								
Glass	4,339,033	$10,772,151	$2.48	5,149,656	$12,815,511	$2.49	+19	------
Molding	6,113,520	10,140,458	1.66	8,139,804	13,667,697	1.68	+33	+1
Building	59,307,353	47,879,130	.81	67,804,295	55,862,325	.82	+14	+1
Paving	31,520,407	25,849,473	.82	36,562,509	29,406,951	.80	+16	−2
Grinding and polishing [2]	1,080,886	2,063,866	1.91	1,299,760	2,670,791	2.05	+20	+7
Fire or furnace	318,373	429,512	1.35	372,890	522,875	1.40	+17	+4
Engine	1,883,580	1,830,549	.97	1,999,176	2,001,707	1.00	+6	+3
Filter	189,243	376,596	1.99	277,134	533,312	1.92	+46	−4
Railroad ballast [3]	955,996	407,234	.43	901,580	424,457	.47	−6	+9
Other [4]	2,300,240	1,961,224	.85	2,475,129	2,444,528	.99	+8	+16
Total commercial sand	108,008,631	101,710,193	.94	124,981,933	120,350,154	.96	+16	+2
Gravel:								
Building	49,788,200	49,319,528	.99	57,093,484	57,587,369	1.01	+15	+2
Paving	60,571,091	52,972,235	.87	62,755,788	55,834,416	.89	+4	+2
Railroad ballast [5]	10,444,070	5,618,124	.54	9,451,187	5,249,241	.56	−10	+4
Other [6]	2,393,486	1,716,039	.72	3,274,239	2,303,464	.70	+37	−3
Total commercial gravel	123,196,847	109,625,926	.89	132,574,698	120,974,490	.91	+8	+2
Total commercial sand and gravel	231,205,478	211,336,119	.91	257,556,631	241,324,644	.94	+11	+3
GOVERNMENT-AND-CONTRACTOR OPERATIONS [7]								
Sand:								
Building	1,604,000	959,000	.60	2,759,000	1,675,000	.61	+72	+2
Paving	7,424,000	2,820,000	.38	11,159,000	4,286,000	.38	+50	------
Total Government-and-contractor sand	9,028,000	3,779,000	.42	13,918,000	5,961,000	.43	+54	+2
Gravel:								
Building	3,133,000	2,235,000	.71	5,216,000	4,510,000	.86	+66	+21
Paving	75,738,000	31,093,000	.41	93,765,000	43,245,000	.46	+24	+12
Total Government-and-contractor gravel	78,871,000	33,328,000	.42	98,981,000	47,755,000	.48	+25	+14
Total Government-and-contractor sand and gravel	87,899,000	37,107,000	.42	112,899,000	53,716,000	.48	+28	+14
COMMERCIAL AND GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand	117,036,000	105,489,000	.90	138,900,000	126,311,000	.91	+19	+1
Gravel	202,068,000	142,954,000	.71	231,555,000	168,729,000	.73	+15	+3
Grand total	319,104,000	248,443,000	.78	370,455,000	295,040,000	.80	+16	+3

[1] Includes Alaska and Puerto Rico.
[2] Includes blast sand as follows—1949: 393,427 tons valued at $1,222,513; 1950: 470,717 tons, $1,463,623.
[3] Includes ballast sand produced by railroads for their own use as follows—1949: 169,219 tons valued at $13,748; 1950: 188,470 tons, $35,790.
[4] Includes some sand used by railroads for fills and similar purposes as follows—1949: 406,344 tons valued at $101,177; 1950: 198,616 tons, $59,992.
[5] Includes ballast gravel produced by railroads for their own use as follows—1949: 4,406,251 tons valued at $1,748,602; 1950: 3,959,670 tons, $1,361,734.
[6] Includes some gravel used by railroads for fills and similar purposes as follows—1949: 759,841 tons valued at $240,217; 1950: 828,723 tons, $184,105.
[7] Approximate figures for States, counties, municipalities, and other Government agencies directly or under lease.

DOMESTIC PRODUCTION

The production of sand and gravel in 1950 totaled 370,455,000 short tons valued at $295,040,000, 16 percent in quantity and 19 percent in value more than the output of 319,104,000 short tons valued at $248,443,000 in 1949. Increased construction activities in this country were reflected in a similar increase in the sand and gravel industry.

In 1950 California was the largest producer, followed by Michigan, New York, Wisconsin, Illinois, Texas, Ohio, Minnesota, and Pennsylvania, in the order named. These nine States, each with an output exceeding 13,000,000 tons, accounted for 51 percent of the total production.

Tables 3 and 4 show details of production by States and uses in 1950.

TABLE 2.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States,[1] 1946–50

Year	Sand		Gravel (including railroad ballast)		Total	
	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)
1946	96, 440	74, 975	157, 691	96, 411	254, 131	171, 386
1947	108, 719	94, 154	178, 940	122, 715	287, 659	216, 869
1948	118, 661	107, 915	200, 605	144, 583	319, 266	252, 498
1949	117, 036	105, 489	202, 068	142, 954	319, 104	248. 443
1950	138, 900	126, 311	231, 555	168, 729	370, 455	295, 040

[1] Includes Alaska and Puerto Rico.

TABLE 3.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States

State	Short tons	Value	State	Short tons	Value
Alabama	3, 616, 363	$2, 463, 722	New Hampshire	[1] 1, 713, 284	[1] $226, 424
Alaska	3, 050, 020	2, 377, 407	New Jersey	[1] 7, 620, 422	[1] 8, 636, 141
Arizona	2, 498, 777	1, 590, 001	New Mexico	937, 653	923, 270
Arkansas	4, 118, 080	3, 446, 578	New York	21, 778, 089	18, 075, 237
California	41, 894, 039	35, 547, 558	North Carolina	8, 352, 475	5, 465, 067
Colorado	5, 154, 287	3, 940, 439	North Dakota	4, 270, 838	1, 660, 371
Connecticut	2, 998, 424	1, 861, 741	Ohio	15, 664, 175	16, 209, 267
Delaware	367, 524	291, 715	Oklahoma	3, 286, 834	2, 356, 853
Florida	2, 793, 865	2, 806, 431	Oregon	8, 199, 900	8, 168, 293
Georgia	[1] 1, 211, 782	[1] 936, 726	Pennsylvania	13, 858, 154	17, 172, 215
Idaho	4, 281, 908	3, 043, 905	Puerto Rico	101, 013	103, 806
Illinois	18, 695, 433	16, 531, 797	Rhode Island	579, 528	580, 322
Indiana	9, 723, 033	7, 516, 509	South Carolina	348, 060	166, 710
Iowa	8, 994, 822	4, 795, 835	South Dakota	5, 392, 247	2, 750, 847
Kansas	9, 781, 123	6, 782, 285	Tennessee	4, 152, 684	4, 411, 105
Kentucky	2, 382, 672	2, 262, 964	Texas	17, 972, 105	15, 707, 724
Louisiana	5, 505, 362	6, 310, 425	Utah	3, 435, 277	2, 251, 515
Maine	4, 897, 143	1, 726, 217	Vermont	1, 040, 977	661, 994
Maryland	[1] 5, 864, 472	[1] 7, 789, 764	Virginia	4, 373, 984	4, 144, 846
Massachusetts	7, 111, 067	5, 430, 790	Washington	10, 605, 791	7, 435, 340
Michigan	24, 556, 911	16, 699, 203	West Virginia	3, 613, 046	6, 241, 057
Minnesota	15, 472, 815	5, 903, 025	Wisconsin	19, 117, 115	11, 959, 012
Mississippi	2, 764, 444	1, 985, 908	Wyoming	1, 937, 943	1, 251, 220
Missouri	6, 232, 411	5, 267, 939	Undistributed [1]	1, 398, 000	612, 000
Montana	9, 044, 125	5, 140, 207			
Nebraska	5, 077, 792	3, 167, 659	Total	370, 455, 000	295, 040, 000
Nevada	2, 617, 052	2, 253, 258			

[1] Output of commercial producers in New Hampshire and of Government-and-contractor operations in Georgia, Maryland, and New Jersey comprises "Undistributed."

TABLE 4.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States and uses

[Commercial unless otherwise indicated]

State	Sand							
	Glass		Molding		Building			
					Commercial		Government-and-contractor	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama			55,143	$102,038	649,850	$512,421	49,353	$76,144
Alaska							96,929	154,567
Arizona					445,330	443,257	19,237	24,046
Arkansas	102,693	$210,742	34,231	70,247	566,854	345,456	330	600
California	(1)	(1)	71,250	172,891	11,328,484	9,426,453	494,275	368,106
Colorado					610,331	644,295	173,026	139,205
Connecticut					691,763	545,480	789,960	92,961
Delaware					67,673	44,648		
Florida					1,612,665	1,515,891	270	200
Georgia	21,617	43,234	74,078	128,156	671,376	367,876		
Idaho					227,621	246,864	10,638	2,784
Illinois	(1)	(1)	1,058,281	2,134,313	4,150,787	2,989,097		
Indiana			507,215	609,392	1,556,877	1,206,161	145	130
Iowa			(1)	(1)	1,452,334	1,089,527		
Kansas					2,254,885	1,467,391	80,421	27,808
Kentucky			(1)	(1)	613,879	611,401		
Louisiana			29,171	25,929	839,393	634,464		
Maine					52,304	26,851	579	129
Maryland	(1)	(1)			1,209,982	1,361,693		
Massachusetts			(1)	(1)	2,207,548	1,579,576	337	250
Michigan	(1)	(1)	2,494,623	2,006,312	2,900,467	2,122,980	43,674	6,672
Minnesota	5,643	25,393	(1)	(1)	1,881,116	1,370,344	1,188	630
Mississippi					475,571	310,667		
Missouri	388,009	801,734	66,178	118,201	1,556,449	1,080,647		
Montana					229,717	314,906	486,620	520,309
Nebraska			490	368	531,805	358,338	13,270	12,843
Nevada	(1)	(1)	50,308	97,983	108,057	173,949	37,579	40,385
New Hampshire					(1)	(1)		
New Jersey	(1)	(1)	1,388,305	3,016,305	1,851,341	1,493,568		
New Mexico					278,186	275,526	20,645	23,850
New York			467,791	1,043,972	6,175,873	4,849,065	107,875	21,444
North Carolina					623,256	376,403	46,050	37,890
North Dakota					112,923	106,585	52	125
Ohio	(1)	(1)	618,385	1,629,910	3,416,870	3,244,043	810	450
Oklahoma	(1)	(1)	(1)	(1)	645,152	362,182	4,290	3,218
Oregon			2,430	1,080	846,996	979,166	139,356	50,500
Pennsylvania	(1)	(1)	300,574	698,431	4,034,075	4,604,909		
Puerto Rico							480	960
Rhode Island			(1)	(1)	150,627	131,884		
South Carolina					212,954	78,941		
South Dakota					256,726	221,053	58,015	2,149
Tennessee	(1)	(1)	203,516	541,576	936,422	1,122,640		
Texas	(1)	(1)	(1)	(1)	3,782,955	2,826,363	355	445
Utah			(1)	(1)	328,657	239,538	405	150
Vermont					36,775	31,591		
Virginia	(1)	(1)	2,595	1,864	616,835	523,650		
Washington	7,018	42,108	(1)	(1)	1,306,092	953,357	3,864	4,192
West Virginia	(1)	(1)	(1)	(1)	473,574	708,928		
Wisconsin			(1)	(1)	2,672,341	1,779,959	58,422	32,989
Wyoming					(1)	(1)	20,562	28,651
Undistributed [1]	4,624,676	11,692,300	715,240	1,268,729	152,547	162,341		
Total	5,149,656	12,815,511	8,139,804	13,667,697	67,804,295	55,862,325	2,759,000	1,675,000

[1] Figures that may not be shown separately are combined as "Undistributed."

TABLE 4.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States and uses—Con.

State	Sand—Continued							
	Paving				Grinding and polishing [2]		Fire or furnace	
	Commercial		Government-and-contractor					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	378,723	$221,693	167,793	$17,439				
Alaska	(1)	(1)	(1)	(1)				
Arizona	13,234	16,678	10,522	8,836				
Arkansas	380,108	255,574	57,915	11,582	18,254	$10,952		
California	4,084,256	3,084,037	1,273,822	510,973	76,758	236,254		
Colorado	22,443	28,287	246,205	34,832				
Connecticut	286,623	208,130	20,588	3,775				
Delaware	123,236	77,759						
Florida	225,695	163,628			4,992	2,796		
Georgia	260,586	154,563			59,234	119,415		
Idaho	34,406	25,723	237,796	222,705				
Illinois	1,544,074	1,139,803	48,980	36,610	115,985	373,249	37,226	$103,446
Indiana	1,300,114	962,743	10,943	3,258			(1)	(1)
Iowa	479,118	346,224	171,514	55,937	(1)	(1)		
Kansas	1,178,041	674,360	294,930	101,091	(1)	(1)		
Kentucky	440,327	404,808	24,300	18,000				
Louisiana	693,967	863,148	134,974	61,186				
Maine	56,902	31,584	468,976	152,906				
Maryland	1,659,259	1,982,553	(1)	(1)			(1)	(1)
Massachusetts	719,051	470,443	56,809	38,416	261	241		
Michigan	2,246,180	1,693,724	151,796	60,191	(1)	(1)		
Minnesota	605,518	398,354	89,654	36,152	(1)	(1)		
Mississippi	189,432	134,796	157,990	17,348				
Missouri	849,360	630,466	25,914	16,607	156,831	356,140	9,348	4,032
Montana	(1)	(1)	243,229	50,912				
Nebraska	245,160	131,515	49,300	15,092	270	200		
Nevada	16,356	37,323	41,180	12,122				
New Hampshire	(1)	(1)	334,293	38,254				
New Jersey	1,961,127	1,071,216	(1)	(1)	80,372	277,542	25,463	41,043
New Mexico			329	1,067	(1)	(1)		
New York	5,206,168	4,229,997	235,378	71,357			(1)	(1)
North Carolina	363,061	190,895	3,747,707	1,303,640	(1)	(1)		
North Dakota	89,575	77,755						
Ohio	2,180,904	1,943,705	48	86	(1)	(1)	72,709	165,827
Oklahoma	259,607	147,788	193,603	39,889	(1)	(1)		
Oregon	343,716	340,096	43,512	19,189	5,738	3,188		
Pennsylvania	2,239,446	2,361,424	1,701	806	373,587	722,407	49,216	87,808
Puerto Rico			18,707	17,634				
Rhode Island	122,220	98,780	83,148	48,168				
South Carolina	(1)	(1)	25,635	11,441	(1)	(1)	(1)	(1)
South Dakota	341,950	290,497	134,982	62,006				
Tennessee	630,308	664,021	62,880	12,576	(1)	(1)	(1)	(1)
Texas	1,807,689	1,499,696	208,117	56,101	34,383	166,089		
Utah	137,135	109,179	189,675	159,983				
Vermont	38,756	22,189	87,286	23,537	37,612	13,931		
Virginia	784,693	490,066	85,952	104,207	(1)	(1)		
Washington	440,589	354,074	180,806	107,647	(1)	(1)		
West Virginia	611,989	767,381	17,939	15,166	(1)	(1)	25,519	28,740
Wisconsin	852,214	528,384	1,408,475	550,907	(1)	(1)		
Wyoming	1,742	2,680	10,460	7,460				
Undistributed [1]	117,451	79,212	104,000	149,000	335,483	388,387	153,409	91,979
Total	36,562,509	29,406,951	11,159,000	4,286,000	1,299,760	2,670,791	372,890	522,875

[1] Figures that may not be shown separately are combined as "Undistributed."
[2] Includes 470,717 tons of blast sand valued at $1,463,623.

TABLE 4.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States and uses—Con.

State	Sand—Continued							
	Engine		Filter		Railroad ballast[3]		Other[4]	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	(1)	(1)	(1)	(1)			10,000	$22,500
Alaska								
Arizona	4,806	$5,406					(1)	(1)
Arkansas	(1)	(1)			(1)	(1)	(1)	(1)
California	(1)	(1)	12,740	$70,170	7,800	$2,802	65,009	72,147
Colorado	25,661	30,142					30,915	7,075
Connecticut			10,504	4,731			(1)	(1)
Delaware	53,661	26,830						
Florida	1,500	840					5,326	4,358
Georgia	10,128	5,820	3,470	17,350			109,993	96,312
Idaho					14,466	14,250	3,245	3,606
Illinois	101,299	93,564	(1)	(1)	275,482	100,977	145,380	314,530
Indiana	135,788	81,086			52,385	35,020	(1)	(1)
Iowa	38,713	43,956	(1)	(1)	(1)	(1)	83,814	44,746
Kansas	82,659	71,838	7,653	7,209	79,761	42,750	70,426	29,052
Kentucky	68,531	59,762			(1)	(1)		
Louisiana	9,865	7,181	660	231	14,446	10,600	9,955	3,778
Maine	(1)	(1)					(1)	(1)
Maryland	(1)	(1)					5,867	3,520
Massachusetts	29,723	18,040	22,544	12,390			30,538	22,353
Michigan	(1)	(1)			(1)	(1)	23,278	38,867
Minnesota	42,112	34,286	4,453	3,117	71,062	19,136	19,727	7,402
Mississippi	14,350	8,279			103,532	41,480	6,252	3,632
Missouri	29,743	22,576	(1)	(1)	(1)	(1)	(1)	(1)
Montana							(1)	(1)
Nebraska	110,180	55,630			8,522	2,175	16,897	3,543
Nevada							(1)	(1)
New Hampshire	(1)	(1)	(1)	(1)				
New Jersey	29,250	18,896	48,220	134,898			397,324	257,793
New Mexico								
New York	92,082	67,165	62,202	42,226	45,452	22,726	142,900	93,308
North Carolina	20,000	20,000	(1)	(1)	(1)	(1)	(1)	(1)
North Dakota							2,240	698
Ohio	54,469	85,644	46,310	65,728	10,750	8,447	209,949	213,169
Oklahoma	(1)	(1)	(1)	(1)			73,773	59,413
Oregon	34,312	19,421					36,173	21,176
Pennsylvania	287,921	565,344	(1)	(1)			169,820	309,639
Puerto Rico								
Rhode Island								
South Carolina	(1)	(1)	(1)	(1)			(1)	(1)
South Dakota					(1)	(1)	(1)	(1)
Tennessee	(1)	(1)	(1)	(1)			(1)	(1)
Texas	64,167	44,720	(1)	(1)	15,735	11,248	14,883	16,861
Utah	(1)	(1)	(1)	(1)			(1)	(1)
Vermont	2,218	1,748					3,927	2,829
Virginia	109,930	76,972					69,669	64,368
Washington					1,389	930	78,634	34,902
West Virginia	197,114	314,237					(1)	(1)
Wisconsin	23,105	15,552	2,800	4,000	(1)	(1)	95,042	53,209
Wyoming							2,160	1,600
Undistributed[1]	325,889	206,772	55,578	171,262	200,798	111,916	542,013	638,142
Total	1,999,176	2,001,707	277,134	533,312	901,580	424,457	2,475,129	2,444,528

[1] Figures that may not be shown separately are combined as "Undistributed."
[3] Includes 188,470 tons of ballast sand valued at $35,790, produced by railroads for their own use.
[4] Includes 198,616 tons of sand valued at $59,992, used by railroads for fills and similar purposes.

TABLE 4.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States and uses—Con.

State	Gravel							
	Building				Paving			
	Commercial		Government-and-contractor		Commercial		Government-and-contractor	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	883,775	$839,704			530,898	$480,096	616,231	$42,894
Alaska			366,195	$422,275	(1)	(1)	(1)	(1)
Arizona	269,787	282,408	30,051	48,082	467,591	344,444	1,131,921	259,604
Arkansas	103,110	117,107	638	1,000	955,868	984,912	1,571,479	1,248,693
California	11,177,657	10,251,356	908,904	922,357	5,944,569	5,327,325	5,709,788	3,673,645
Colorado	443,374	421,796	527,233	494,778	373,881	350,599	2,698,256	1,787,590
Connecticut	472,944	474,539	44,000	66,000	409,891	320,311	105,524	37,311
Delaware	22,042	35,615			100,912	106,863		
Florida	675,157	975,049	6,750	1,250	72,510	97,419	189,000	45,000
Georgia	1,300	4,000					(1)	(1)
Idaho	335,338	348,519	38,087	25,565	518,259	440,659	2,720,684	1,678,150
Illinois	4,491,126	3,549,686	56,574	23,832	3,839,670	2,470,372	834,200	518,550
Indiana	1,813,580	1,585,056	1,148	755	2,992,593	2,239,928	550,771	229,793
Iowa	708,105	912,481			1,441,857	1,119,815	4,401,266	915,196
Kansas	165,502	138,749	775	600	1,132,755	799,747	4,417,287	3,405,816
Kentucky	403,783	475,050			182,572	194,150	523,126	406,646
Louisiana	1,216,365	1,453,620			2,363,522	3,131,343	124,674	62,174
Maine	98,175	96,835	9,850	875	152,312	116,039	3,996,292	1,269,545
Maryland	1,084,760	1,582,026			1,817,132	2,727,295	(1)	(1)
Massachusetts	1,837,998	1,868,472	506	300	1,159,181	925,387	909,675	266,312
Michigan	3,220,925	2,907,674	439,156	112,089	6,436,051	4,514,356	5,630,890	2,123,123
Minnesota	1,026,844	1,335,766	44	60	1,462,814	1,090,861	8,590,254	999,291
Mississippi	662,748	616,951			685,628	611,438	331,516	182,176
Missouri	987,173	878,018			871,407	619,731	890,424	438,814
Montana	165,276	186,177	1,743,121	1,607,550	349,574	349,761	5,365,078	1,881,199
Nebraska	1,469,240	1,011,354	58,280	81,240	2,107,337	1,285,842	466,366	208,019
Nevada	36,534	70,426	94,575	103,580	18,334	39,227	1,914,985	1,021,494
New Hampshire	(1)	(1)			83,670	131,300	1,378,991	188,170
New Jersey	797,059	919,970			538,633	480,814	(1)	(1)
New Mexico	339,202	407,261	35,927	45,497	(1)	(1)	135,113	83,751
New York	2,885,389	3,156,566	10,364	2,755	4,241,207	3,838,563	1,536,106	386,364
North Carolina	343,857	447,512	20,000	30,000	1,049,500	1,115,652	2,078,233	1,864,352
North Dakota	328,869	471,844	30,554	1,972	320,286	219,008	2,815,749	587,403
Ohio	2,493,839	2,374,059			4,536,227	4,210,190	462,333	134,386
Oklahoma	173,702	129,345	39,400	39,400	282,444	246,267	1,319,474	773,679
Oregon	1,376,139	1,543,056	45,000	60,000	2,128,766	2,291,897	2,905,641	2,655,314
Pennsylvania	3,268,409	3,812,669			1,831,925	2,020,313	501,128	85,143
Puerto Rico			438	800			81,388	84,412
Rhode Island	68,206	65,423			104,831	154,181	21,538	24,452
South Carolina							56,657	19,322
South Dakota	37,843	48,528	108	56	850,317	606,984	3,571,154	1,421,877
Tennessee	605,653	792,552	176,958	13,108	859,873	799,350	432,937	163,303
Texas	4,886,939	5,667,788	190	450	3,706,875	3,927,559	2,038,431	377,344
Utah	517,164	383,032	161,950	64,318	315,323	206,131	1,669,668	1,029,180
Vermont	39,599	52,892			106,497	93,428	671,796	409,799
Virginia	728,380	1,063,778			1,203,087	1,454,812	704,406	236,733
Washington	1,631,972	1,261,180	19,433	19,551	952,995	819,844	5,122,236	3,247,401
West Virginia	594,871	738,696			418,052	549,353	134,679	68,552
Wisconsin	2,075,008	1,628,860	273,251	228,116	2,581,893	1,803,249	7,513,887	4,094,651
Wyoming	(1)	(1)	76,124	91,787	115,281	72,119	1,513,463	890,081
Undistributed [1]	128,766	203,924			140,988	105,482	3,410,000	1,723,000
Total	57,093,484	57,587,369	5,216,000	4,510,000	62,755,788	55,834,416	93,765,000	43,245,000

[1] Figures that may not be shown separately are combined as "Undistributed."

TABLE 4.—Sand and gravel sold or used by commercial and Government-and-contractor producers in the United States in 1950, by States and uses—Con.

State	Gravel—Continued				Sand and gravel			
	Railroad ballast [5]		Other [6]		Total commercial		Total Government-and-contractor	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	133,056	$66,690	59,711	$54,816	2,782,986	$2,327,245	833,377	$136,477
Alaska					(1)	(1)	(1)	(1)
Arizona	688	688	(1)	(1)	1,307,046	1,249,433	1,191,731	340,568
Arkansas	110,883	81,495	(1)	(1)	2,487,718	2,189,703	1,630,362	1,256,875
California	113,123	76,310	227,619	159,708	33,507,250	30,072,477	8,386,789	5,475,081
Colorado			2,962	1,840	1,509,567	1,484,034	3,644,720	2,456,405
Connecticut	(1)	(1)	37,190	12,862	2,038,352	1,661,694	960,072	200,047
Delaware					367,524	291,715		
Florida					2,597,845	2,759,981	196,020	46,450
Georgia					1,211,782	936,726	(1)	(1)
Idaho	71,344	8,543	70,024	26,537	1,274,703	1,114,701	3,007,205	1,929,204
Illinois	898,027	460,157	31,461	15,342	17,755,679	15,952,805	939,754	578,992
Indiana	524,736	377,460	102,604	82,891	9,160,026	7,282,573	563,007	233,936
Iowa	70,086	39,340	52,286	67,718	4,422,042	3,824,702	4,572,780	971,133
Kansas	780	1,170	(1)	(1)	4,987,710	3,246,970	4,793,413	3,535,315
Kentucky	93,807	65,526			1,835,246	1,838,318	547,426	424,646
Louisiana	68,370	56,771			5,245,714	6,187,065	259,648	123,360
Maine	48,532	25,854	6,279	2,321	421,446	302,762	4,475,697	1,423,455
Maryland			40,117	31,332	5,864,472	7,789,764	(1)	(1)
Massachusetts	(1)	(1)	35,844	13,810	6,143,740	5,125,512	967,327	305,278
Michigan	387,661	285,937	54,010	33,104	18,291,395	14,397,128	6,265,516	2,302,075
Minnesota	1,397,145	524,960	272,651	52,998	6,791,675	4,866,892	8,681,140	1,036,133
Mississippi	101,138	38,770	36,287	20,371	2,274,938	1,786,384	489,506	199,524
Missouri	298,116	208,029	3,504	2,784	5,316,073	4,812,518	916,338	455,421
Montana	201,195	129,176	207,779	66,933	1,206,077	1,080,237	7,838,048	4,059,970
Nebraska			675	1,500	4,490,576	2,850,465	587,216	317,194
Nevada	146,812	119,025			528,733	1,075,677	2,088,319	1,177,581
New Hampshire	(1)	(1)	47,825	40,430	(1)	(1)	1,713,284	226,424
New Jersey	(1)	(1)	67,257	138,844	7,620,422	8,636,141	(1)	(1)
New Mexico					745,639	769,105	192,014	154,165
New York	(1)	(1)	559,397	239,197	19,888,366	17,593,317	1,889,723	481,920
North Carolina	26,102	18,914	(1)	(1)	2,460,485	2,229,185	5,891,990	3,235,882
North Dakota	426,951	169,328	143,639	25,653	1,424,483	1,070,871	2,846,355	589,500
Ohio	663,924	442,437	609,638	765,376	15,200,984	16,074,345	463,191	134,922
Oklahoma			(1)	(1)	1,730,067	1,500,667	1,556,767	856,186
Oregon	272,152	166,049	19,969	18,161	5,066,391	5,383,290	3,133,509	2,785,003
Pennsylvania	79,584	43,830	43,020	69,200	13,355,325	17,086,266	502,829	85,949
Puerto Rico							101,013	103,806
Rhode Island			(1)	(1)	474,842	507,702	104,686	72,620
South Carolina					265,768	135,947	82,292	30,763
South Dakota	65,552	31,316	600	300	1,627,988	1,264,759	3,764,259	1,486,088
Tennessee	(1)	(1)	295	177	3,479,909	4,222,118	672,775	188,987
Texas	1,167,137	664,067	47,768	52,773	15,725,012	15,273,384	2,247,093	434,340
Utah	88,722	39,053	(1)	(1)	1,413,579	997,884	2,021,698	1,253,631
Vermont			16,511	10,050	281,895	228,658	759,082	433,336
Virginia			3,813	3,813	3,583,626	3,803,906	790,358	340,940
Washington	650,555	480,737	203,899	85,502	5,279,452	4,056,549	5,326,339	3,378,791
West Virginia	(1)	(1)	10,962	13,662	3,460,428	6,157,339	152,618	83,718
Wisconsin	856,615	272,741	141,480	58,509	9,863,080	7,052,349	9,254,035	4,906,663
Wyoming	153,293	80,475			317,334	233,241	1,620,609	1,017,979
Undistributed [1]	335,101	274,393	117,163	134,950	471,241	540,140	3,977,000	2,449,000
Total	9,451,187	5,249,241	3,274,239	2,303,464	257,556,631	241,324,644	112,899,000	53,716,000

[1] Figures that may not be shown separately are combined as "Undistributed."
[5] Includes 3,959,670 tons of ballast gravel valued at $1,361,734, produced by railroads for their own use.
[6] Includes 828,723 tons of gravel valued at $184,105, used by railroads for fills and similar purposes.

Government-and-Contractor Production.—As shown in figure 2 and tables 5 and 6, the output of sand and gravel from noncommercial or Government-and-contractor operations in 1950 was 30 percent of the total tonnage compared with 28 percent in 1949. The value of this output represented 18 percent of the total dollar value of the industry. A decided increase in the Government-and-contractor production in 1950 was noted.

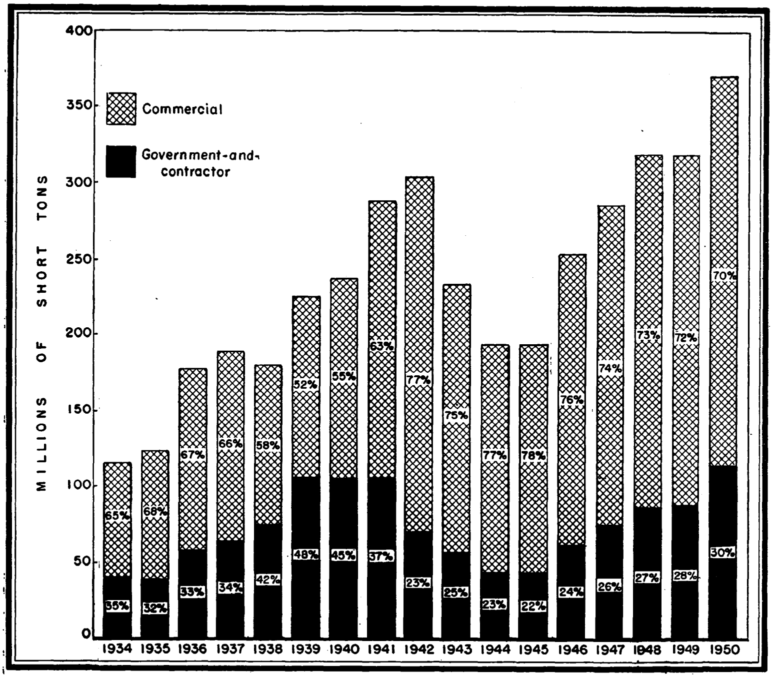

FIGURE 2.—Sand and gravel sold or used in the United States by commercial and Government-and-contractor producers, 1934–50.

TABLE 5.—Sand and gravel sold or used by Government-and-contractor producers in the United States,[1] 1946–50, by uses

Year	Sand				Gravel				Total Government-and-contractor sand and gravel	
	Building		Paving		Building		Paving			
	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)	Quantity (thousand short tons)	Value (thousand dollars)
1946	894	313	4,752	1,629	2.752	1,416	53,641	19.932	62,039	23,290
1947	1,551	717	6,049	2,316	2,208	1,541	65,289	29,923	75,097	34,497
1948	1,529	811	7,336	3,452	5,487	3,405	71,411	33,510	85,763	41,178
1949	1,604	959	7,424	2,820	3,133	2,235	75,738	31,093	87,899	37,107
1950	2,759	1,675	11,159	4,286	5,216	4,510	93,765	43,245	112,899	53,716

[1] Includes Alaska and Puerto Rieo.

States reported 55 percent of the total Government-and-contractor output in 1950, counties 33, Federal agencies 10, and municipalities 2. In 1950 contractors furnished 57 percent of the Government-and-contractor tonnage and construction and maintenance crews 43 percent. The average value increased to 48 cents a ton in 1950 from 42 cents in 1949.

TABLE 6.—Sand and gravel sold or used by Government-and-contractor producers in the United States,[1] 1947–50, by type of producer

Type of producer	1947		1948		1949		1950	
	Thousand short tons	Average value per ton	Thousand short tons	Average value per ton	Thousand short tons	Average value per ton	Thousand short tons	Average value per ton
Construction and maintenance crews	38,662	$0.35	42,531	$0.34	43,586	$0.31	48,742	$0.33
Contractors	36,435	.58	43,232	.62	44,313	.53	64,157	.59
Total	75,097	.46	85,763	.48	87,899	.42	112,899	.48
States	37,017	.49	45,166	.55	44,354	.44	61,798	.50
Counties	26,958	.34	32,260	.32	33,822	.31	37,841	.30
Municipalities	1,573	.46	1,881	.41	2,131	.40	2,109	.54
Federal agencies	9,549	.70	6,456	.83	7,592	.82	11,151	.89
Total	75,097	.46	85,763	.48	87,899	.42	112,899	.48

[1] Includes Alaska and Puerto Rico.

DEGREE OF PREPARATION

Whereas Government-and-contractor sand and gravel commonly includes a high proportion of unprepared material, the reverse is true of commercial plants. As preparation adds substantially to production costs, commercial output has the higher average value. Table 7 shows this relationship in the past 2 years. Prepared sand and gravel

TABLE 7.—Sand and gravel (prepared or unprepared) sold or used by producers in the United States,[1] 1949–50, by commercial and Government-and-contractor operations

	1949			1950		
	Quantity		Average value per ton	Quantity		Average value per ton
	Short tons	Percent		Short tons	Percent	
Commercial operations:						
Prepared	210,756,159	91	$0.96	232,761,019	90	$0.98
Unprepared	20,449,319	9	.47	24,795,612	10	.51
Total	231,205,478	100	.91	257,556,631	100	.94
Government-and-contractor operations:						
Prepared	24,807,000	28	.91	41,935,000	37	.87
Unprepared	63,092,000	72	.23	70,964,000	63	.24
Total	87,899,000	100	.42	112,899,000	100	.48
Grand total	319,104,000		.78	370,455,000		.80

[1] Includes Alaska and Puerto Rico.

(commercial and Government-and-contractor) represented 74 percent of the total production in 1950, the same as the previous year. While commercial operations used a slightly lower percentage of prepared sand and gravel in 1950 than in 1949, the Government-and-contractor operations increased their use of that material.

SIZE OF PLANTS

The average plant output of commercial operators, except railroad plants, approximated 101,000 short tons in 1950 compared with 92,000 short tons in 1949. Plants producing between 100,000 and 200,000 tons in 1950 supplied 20.5 percent of the total output, the largest quantity produced by any one group. The number of small plants producing under 25,000 short tons decreased from 953 to 890, while those producing 25,000 to 50,000 tons increased from 425 to 478. The number of plants with an output of over 1,000,000 tons increased from 14 to 22, with a total increased tonnage exceeding 12,000,000 tons, the largest tonnage increase recorded in 1950 by any group. Details of output, by size groups, are shown in table 8.

TABLE 8.—Comparison of number and production of commercial sand and gravel plants in the United States, 1949–50, by size groups [1]

Size group, in short tons	1949				1950			
	Plants [2]		Production		Plants [2]		Production	
	Number	Percent of total	Thousand short tons	Percent of total	Number	Percent of total	Thousand short tons	Percent of total
Less than 25,000	953	38.8	9,320	4.1	890	35.6	8,952	3.6
25,000 to less than 50,000	425	17.3	15,344	6.8	478	19.1	17,242	6.8
50,000 to less than 100,000	449	18.3	32,019	14.2	439	17.6	31,058	12.3
100,000 to less than 200,000	337	13.7	47,223	21.0	367	14.7	51,733	20.5
200,000 to less than 300,000	146	5.9	35,576	15.8	147	5.9	35,676	14.1
300,000 to less than 400,000	53	2.2	18,147	8.0	73	2.9	24,999	9.9
400,000 to less than 500,000	38	1.5	16,983	7.5	31	1.2	13,933	5.5
500,000 to less than 600,000	16	.7	8,703	3.9	22	.9	12,147	4.8
600,000 to less than 700,000	6	.2	3,848	1.7	14	.6	8,745	3.5
700,000 to less than 800,000	11	.4	8,310	3.7	6	.2	4,388	1.7
800,000 to less than 900,000	7	.3	5,906	2.6	4	.1	3,386	1.4
900,000 to less than 1,000,000	3	.1	2,881	1.3	7	.3	6,775	2.7
1,000,000 and over	14	.6	21,204	9.4	22	.9	33,347	13.2
Total	2,458	100.0	225,464	100.0	2,500	100.0	252,381	100.0

[1] Excludes operations by or for States, counties, municipalities, and Federal Government agencies as follows—1949: 807 operations with an output of 87,899,000 tons of sand and gravel; 1950: 835 operations, 112,899,000 tons. Excludes operations by or for railroads as follows—1949: 128 operations, with an output of 5,741,000 tons of sand and gravel; 1950: 142 operations, 5,175,000 tons. Includes Alaska.

[2] Includes a few companies operating more than one plant but not submitting separate returns for individual plants.

METHODS OF TRANSPORTATION

Truck transportation in 1950 moved 41 percent of the shipments from commercial sand and gravel plants. Assuming the entire output of Government-and-contractor operations to be moved by truck, 71 percent of the domestic sand and gravel output was so transported, compared with 69 percent during 1949. Railroads carried 20 percent, a 2-percent decrease from the previous year. Shipments by waterway, a method important in a few areas, remained at 6 percent and unspecified transportation at 3 percent. As shown in table 9, 91 percent of the total tonnage shipped (commercial and Government-and-contractor) moved by truck and rail.

TABLE 9.—Sand and gravel sold or used in the United States,[1] 1948–50, by method of transportation

	1948		1949		1950	
	Thousand short tons	Percent of total	Thousand short tons	Percent of total	Thousand short tons	Percent of total
Commercial:						
Truck	125,468	39	131,725	41	150,892	41
Rail	78,888	25	70,035	22	72,489	20
Waterway	18,839	6	19,253	6	22,618	6
Unspecified	10,308	3	10,192	3	11,557	3
Total commercial	233,503	73	231,205	72	257,556	70
Government-and-contractor: [2]						
Truck	85,763	27	87,899	28	112,899	30
Grand total	319,266	100	319,104	100	370,455	100

[1] Includes Alaska and Puerto Rico.
[2] Entire output of Government-and-contractor operations assumed to be moved by truck.

CONSUMPTION

Sand and Gravel for Construction.—The demand for sand and gravel by the construction industry in 1950, as indicated by shipments from commercial plants, showed an over-all increase over the previous year as follows: Building sand increased 14 percent; paving sand, 16 percent; building gravel, 15 percent; and paving gravel, 4 percent. This reflected the increased building activity during 1950.

Industrial Sands.—The output of all classes of industrial sands increased in 1950: Molding sand, 33 percent; glass sand, 19 percent; and grinding and polishing, 20 percent. Lesser users also made substantial gains during 1950, as was to be expected because of increased industrial activity in all lines.

Employment and Productivity.—The total number of men employed in the sand and gravel industry in the United States during 1950 averaged more than 26,000, the same as in 1949. The average number of days worked increased slightly. The average number of hours per man per day in 1950 remained the same as the previous year, but the output per man per shift increased from 37.4 short tons to 41.0. As in the previous year, the California-Nevada region employed the largest number of men, while the highest production per man per shift continued to be in the Michigan-Wisconsin area. Table 10 gives a breakdown of employment and production of commercial sand and gravel, by regions.

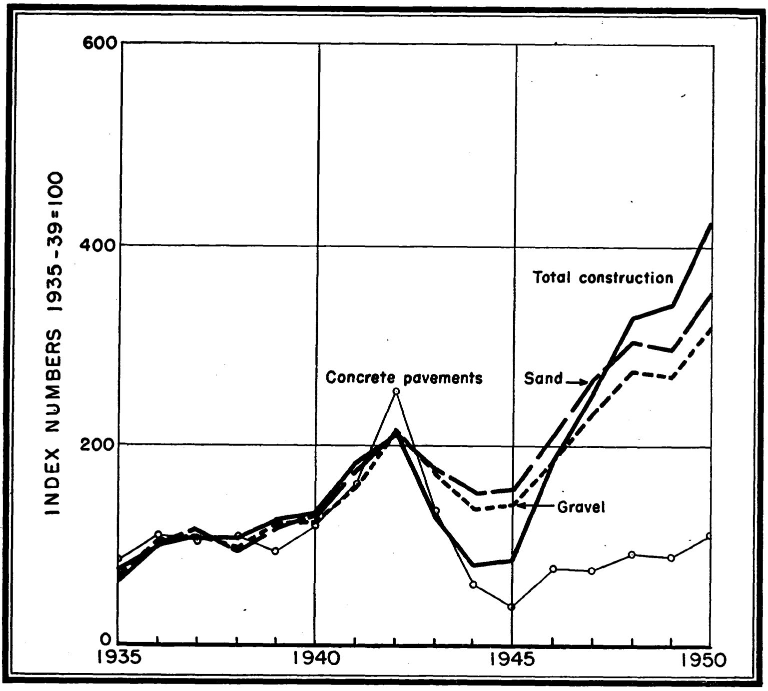

FIGURE 3.—Value of sand and gravel production compared with total construction (contract awards, value) and concrete pavements (contract awards, square yards) in the United States, 1935–50. Data on construction and pavements from Survey of Current Business.

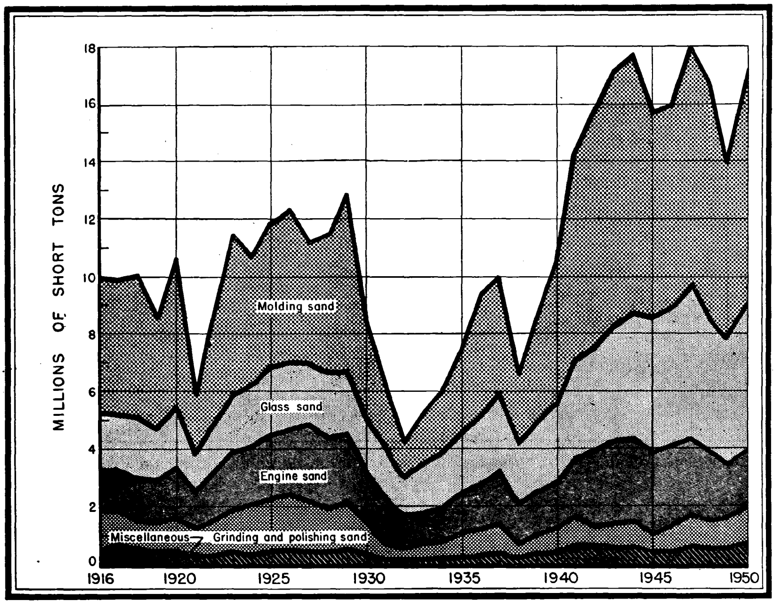

FIGURE 4.—Production of industrial sands in the United States, 1916–50.

TABLE 10.—Employment in the commercial sand and gravel industry and average output per man in the United States, 1946–50, by regions [1]

	Employment					Production (short tons)			Percent of commercial industry represented
	Average number of men	Time employed				Commercial sand and gravel	Average per man		
		Average number of days	Total man-shifts	Man-hours			Per shift	Per hour	
				Average man per day	Total				
1946	18,400	240	4,408,376	8.8	39,001,584	159,203,204	36.1	4.1	82.9
1947	21,244	246	5,218,164	8.7	45,376,180	179,664,522	34.4	4.0	84.5
1948	21,895	246	5,389,167	8.6	46,103,345	200,706,763	37.2	4.4	86.0
1949									
Maine, N. H., Vt., R. I., Mass., and Conn.	911	208	189,549	8.5	1,616,792	7,693,475	40.6	4.8	93.3
N. Y.	1,209	251	303,062	8.3	2,526,065	12,007,995	39.6	4.8	74.7
Pa., N. J., and Del.	2,346	255	598,433	8.5	5,069,300	16,825,512	28.1	3.3	98.0
W. Va., Va., Md., and D. C.	1,723	243	418,457	9.0	3,776,867	9,821,968	23.5	2.6	84.2
S. C., Ga., Ala., Fla., and Miss.	963	269	258,922	9.0	2,336,588	7,641,772	29.5	3.3	96.4
N. C., Ky., and Tenn.	1,008	264	265,967	9.0	2,398,965	6,680,971	25.1	2.8	91.6
Ark., La., and Tex.	2,002	270	540,929	9.2	4,956,555	17,672,697	32.7	3.6	84.3
Ohio	1,632	248	404,908	8.5	3,422,198	12,321,225	30.4	3.6	85.1
Ill. and Ind.	1,976	237	467,612	8.4	3,951,075	21,861,734	46.8	5.5	88.3
Mich. and Wis.	2,242	174	389,692	9.1	3,539,429	20,789,113	53.3	5.9	83.6
N. Dak., S. Dak., and Minn.	725	151	109,609	9.0	991,638	5,425,754	49.5	5.5	62.2
Nebr. and Iowa	670	232	155,139	9.4	1,457,397	7,206,448	46.5	4.9	79.9
Kans., Mo., and Okla.	1,155	226	260,650	8.5	2,219,449	9,945,635	38.2	4.5	89.6
Wyo., Colo., N. Mex., Utah, and Ariz.	463	208	96,425	8.2	795,076	4,317,922	44.8	5.4	88.3
Calif. and Nev.	2,417	243	586,278	8.3	4,841,409	27,411,956	46.8	5.7	92.7
Mont., Wash., Oreg., and Idaho	1,522	191	291,079	8.2	2,387,236	12,031,532	41.3	5.0	83.3
Total	22,964	232	5,336,711	8.7	46,286,039	199,655,709	37.4	4.3	86.4
1950									
Maine, N. H., Vt., R. I., Mass., and Conn.	937	217	203,067	8.5	1,731,961	9,312,123	45.9	5.4	94.9
N. Y.	1,293	233	300,994	8.3	2,497,531	15,878,554	52.8	6.4	79.8
Pa., N. J., and Del.	2,472	268	662,479	8.5	5,652,551	21,045,448	31.8	3.7	98.6
W. Va., Va., Md., and D. C.	1,712	254	434,436	9.0	3,916,817	10,858,056	25.0	2.8	84.1
S. C., Ga., Ala., Fla., and Miss.	1,016	264	268,597	9.1	2,434,521	8,978,045	33.4	3.7	98.3
N. C., Ky., and Tenn.	1,024	260	266,351	9.1	2,425,746	7,620,109	28.6	3.1	98.0
Ark., La., and Tex.	2,386	279	665,735	9.2	6,133,414	22,285,420	33.5	3.6	95.0
Ohio	1,876	228	427,104	8.7	3,709,496	14,508,931	34.0	3.9	95.4
Ill. and Ind.	2,233	235	525,549	8.4	4,423,427	25,239,236	48.0	5.7	93.8
Mich. and Wis.	2,175	200	434,808	8.9	3,886,811	25,763,121	59.3	6.6	91.5
N. Dak., S. Dak., and Minn.	704	162	113,762	9.2	1,043,080	6,605,312	58.1	6.3	67.1
Nebr. and Iowa	744	211	157,319	9.4	1,482,332	7,911,238	50.3	5.3	88.8
Kans., Mo., and Okla.	1,076	242	260,668	8.6	2,245,099	11,073,490	42.5	4.9	92.0
Wyo., Colo., N. Mex., Utah, and Ariz.	629	208	130,871	8.5	1,110,598	4,732,405	36.2	4.3	89.4
Calif. and Nev.	2,649	250	663,042	8.2	5,453,921	33,609,269	50.7	6.2	98.7
Mont., Wash., Oreg., and Idaho	1,350	190	256,958	8.2	2,103,427	10,999,531	42.8	5.2	85.8
Total	24,276	238	5,771,740	8.7	50,250,732	236,420,288	41.0	4.7	91.8

[1] Excludes plants operated by or directly for States, counties, municipalities, and Federal Government agencies.

PRICES

The average value for all shipments of sand and gravel in 1950, both from commercial plants and from the Government-and-contractor operations, increased 3 percent over the 1949 figures. Molding sand and sand for the glass and the building industries showed only slight changes. Material for grinding and polishing and for furnace, engine, ballast, and other uses recorded gains as high as 16 percent, while the prices of paving and filter sand showed declines. In nearly all instances gains were reported for the types of gravel used by the various operations.

FOREIGN TRADE [1]

Imports of sand and gravel in 1950 increased to 445,295 short tons valued at $320,557, or 3 percent in tonnage and 1 percent in value over the preceding year. Belgium furnished all but a small portion of the 9,191 short tons of glass sand, while Canada supplied 287,823 short tons of "other sand" and 142,159 short tons of gravel. Importations from other countries were insignificant.

TABLE 11.—Sand and gravel imported for consumption in the United States, 1941–50, by classes

[U. S. Department of Commerce]

Year	Sand				Gravel		Total	
	Glass sand [1]		Other sand [2]					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1941			263,389	$105,088	164,175	$26,132	427,564	$131,220
1942	(3)	$5	408,825	297,122	146,116	60,389	554,941	357,516
1943	18	363	296,262	206,145	86,924	63,381	383,204	269,889
1944	15	181	209,255	129,632	67,929	31,208	277,199	161,021
1945	(3)	148	200,280	126,102	80,861	43,976	281,141	170,226
1946	5,006	9,102	262,484	194,820	83,860	25,847	351,350	229,769
1947	7,804	12,532	297,481	283,884	177,244	100,665	482,529	397,081
1948	16,914	24,134	336,898	302,117	89,174	30,411	442,986	356,662
1949	11,491	20,152	287,452	[4] 277,564	135,227	19,194	434,170	[4] 316,910
1950	9,191	25,481	290,025	266,065	146,079	29,011	445,295	320,557

[1] Classification reads: "Sand containing 95 percent or more silica and not more than 0.6 percent oxide of iron and suitable for manufacture of glass."
[2] Classification reads: 1941–47: "Sand, n. s. p. f. (not specially provided for)"; 1948–50: "Sand, n. s. p. f., crude or manufactured."
[3] Less than 0.5 ton.
[4] Revised figure.

[1] Figures on imports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TECHNOLOGY

A report, Engineering Activities, covering the field of sand and gravel, was presented at the annual meeting of the National Sand and Gravel Association.[2]

New methods of washing and screening gravel and sand were described in the technical press.[3]

The problem of combining stationary and portable operations in one operation has been worked out successfully by a large midwestern gravel company.[4]

New facilities and equipment have been added to the sand and gravel research laboratory at the University of Maryland.[5]

A method for handling a sand and gravel deposit containing clay was the subject of a recent magazine article.[6]

The removal of impurities found in sand and gravel deposits by installing a conical scrubber and dewatering units was explained in a technical journal.[7]

Sand for glass manufacture was described in a recent article.[8]

The use of a rod mill for sand production was described.[9]

Sampling of sand and gravel deposits and the correct evaluation of the results obtained are important to the industry. A recent article has been published explaining certain methods now in use.[10]

---

[2] Walker, Stanton, National Sand and Gravel Association Meeting Report: Washington, D. C., February 1950.

[3] Utley, Harry F., Ingenious Washing Device Utilized at Oregon Aggregates Plant: Pit and Quarry, vol. 42, No. 8, February 1950, pp. 77–78.

[4] Rock Products, vol. 53, No. 6, June 1950, pp. 129–131.

[5] Avery, William M., Sand and Gravel and Ready-Mix Associations Equip New Laboratory for Consolidated Research: Pit and Quarry, vol. 42, No. 10, April 1950, pp. 62–66.

[6] Lenhart, Walter B., Licking a Tough Clay Problem: Rock Products, vol. 53, No. 8, August 1950, pp. 108–111, 219.

[7] Lenhart, Walter B., Gravel Plant Features Removal of Impurities: Rock Products, vol. 53, No. 6, June 1950, pp. 114–117.

[8] Ceramic Industry, vol. 54, No. 1, January 1950, pp. 126–127.

[9] Hale, David P., Jr., Rod-Mill Operation in Sand Production: Rock Products, vol. 53, No. 2, February 1950, pp. 122–124.

[10] Thoenen, J. R., Sampling Florida Dune Sands: Rock Products, vol. 53, No. 6, June 1950, pp. 132–134.

Secondary Metals—Nonferrous

By Archie J. McDermid[1]

GENERAL SUMMARY

MILITARY operations in Korea, which began in June, were directly or indirectly the chief reason for the increased consumption of all nonferrous scrap metals in 1950 and the accompanying rise in secondary metal production. This initial upswing in activity was due more to increased civilian demand for metal products in anticipation of future shortages than to military needs; because the latter did not substantially increase the demand for metal products for some time after hostilities had commenced.

TABLE 1.—Salient statistics of nonferrous secondary metals recovered from scrap processed in the United States, 1949–50

Metal	From new scrap		From old scrap		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Aluminum	136,166	$42,946,756	44,596	$14,065,579	180,762	$57,012,335
Antimony	3,085	2,389,641	14,976	11,600,410	18,061	13,990,051
Copper	329,595	129,860,430	383,548	151,117,912	713,143	280,978,342
Lead	48,043	15,181,588	364,140	115,068,240	412,183	130,249,828
Magnesium	3,023	1,239,430	2,939	1,204,990	5,962	2,444,420
Nickel	3,766	3,234,241	1,914	1,643,743	5,680	4,877,984
Tin	8,378	16,641,389	16,523	32,819,965	24,901	49,461,354
Zinc	186,162	46,168,176	51,651	12,809,448	237,813	58,977,624
Total		257,661,651		340,330,287		597,991,938
1950						
Aluminum	167,308	54,977,409	76,358	25,091,239	243,666	80,068,648
Antimony	3,091	1,818,126	18,771	11,041,102	21,862	12,859,228
Copper	492,028	204,683,648	485,211	201,847,776	977,239	406,531,424
Lead	54,755	14,783,850	427,520	115,430,400	482,275	130,214,250
Magnesium	2,770	1,220,462	4,970	2,189,782	7,740	3,410,244
Nickel	4,014	3,837,384	4,781	4,570,636	8,795	8,408,020
Tin	11,298	21,592,060	24,183	46,217,098	35,481	67,809,158
Zinc	251,933	71,548,972	74,097	21,043,548	326,030	92,592,520
Total		374,461,911		427,431,581		801,893,492

Although the recovered quantities of all secondary metals increased, the average prices for primary antimony, lead, and zinc, on which the values in table 1 are based, were lower in 1950 than in 1949, and, as a result, the calculated total values of secondary antimony and secondary lead were lower in 1950 than in 1949. Prices of lead and aluminum scrap declined slightly in the first 4 months of the year, and those of

[1] Figures on imports and exports compiled by M. B. Price, of the Bureau of Mines, from records of the Department of Commerce.

232294—53——70

copper and zinc scrap increased slightly. Later in the year, when supplies of all metals were less than the demand therefor, prices rose higher as scrap became scarcer. The price of unalloyed copper scrap was reported as high as 45 cents a pound in the "outside" market, and it was generally understood that abnormally high prices were often paid for other kinds of scrap.[2]

Many transactions at high prices were the result of "conversion" deals in which manufacturers of appliances, parts of which were made of scarce metals, purchased scrap and paid smelters to refine it for them. Producers of primary metals voluntarily held price rises to a minimum to stabilize the market, whereas scrap and secondary metal prices were more flexible. In January 1950, when No. 108 primary aluminum alloy was selling for 18.50 cents a pound secondary ingot of the same grade was quoted at 17.50. In December, with No. 108 primary at 20.60 cents, the secondary alloy of the same grade was 31 cents a pound. A similar relation, although not so pronounced, existed between the prices quoted for primary copper and those for copper-alloy ingot, which is made largely from scrap.

On December 11, 1950, the National Production Authority issued Order M–16, which was aimed at providing for the continuous flow of copper-base scrap into normal channels of distribution; it limited accumulations of scrap metal by generators and dealers and prohibited conversion or toll operations without specific permission from NPA. The order was to have become effective January 1, but acceleration of conversion dealings immediately after issuance of the order made it advisable for the Authority to issue an amendment making conversion transactions illegal on and after December 18.

TABLE 2.—Secondary metals recovered as unalloyed metal, in alloys, and in chemical compounds in the United States, 1946–50, in short tons

Metal	1946	1947	1948	1949	1950
Aluminum	278,073	344,837	286,777	180,762	243,666
Antimony	19,115	22,984	21,592	18,061	21,862
Copper	803,546	961,741	972,788	713,143	977,239
Lead	392,787	511,970	500,071	412,183	482,275
Magnesium	5,117	9,503	7,553	5,962	7,307
Nickel	8,248	9,541	8,850	5,680	8,795
Tin	27,671	30,054	30,124	24,901	35,481
Zinc	300,682	310,793	324,639	237,813	326,030

The value of metals recovered from both old and new purchased scrap consumed in 1950 was $801,702,712, compared with $597,991,938 in 1949. The increase is attributable both to the larger quantities recovered and to higher prices for several of the metals.

The quantity of "new" scrap generated each year depends upon the level of industrial activity. The quantity of skimmings, floor sweepings, and defective castings made at foundries increases when the foundries' operations increase. The same is true of clippings resulting from the operations of processors of sheet metal. Such plant scrap is usually disposed of almost as fast as generated, to dealers, smelters, or others, and the quantities reported used indicate the state of industrial activity.

[2] Zimmerman, J., Address to National Association of Waste Material Dealers: Metals, vol. 21, No. 6, December 1950, pp. 7–10.

The volume of "old" scrap generated also depends upon industrial activity. Worn battery plates, the most important lead-scrap item, become available in greater quantity when the use of automobiles is increased, as has been happening consistently over the past few years. War increases general industrial activity and at the same time generates greater quantities of scrap—aluminum from wrecked and obsolete aircraft, brass scrap from fired cartridge cases, etc. Some articles such as building hardware, remain in use over very long periods. The return of this material for reprocessing depends largely upon the rate of demolition of old buildings, which may be slow even during high industrial activity, if replacement materials are scarce.

Although the volume of both new and old scrap depends on the level of industrial activity, that of new scrap is more sensitive to changes in the industrial-activity level. Worn-out equipment may lie forgotten until salvaged in a scrap drive or found by a dealer.

The National Production Authority was organized on September 12 and on September 18 issued its first regulation, which limited inventories of all materials, including scrap, to a reasonable working quantity.

SCOPE OF REPORT

Plants canvassed in nonferrous secondary metal surveys include all known consumers of purchased nonferrous scrap metals, as well as consumers of refined copper and brass ingot. Table 3 classifies the plants canvassed by type of operation and kind of material consumed. Secondary smelters have been recorded in more than one column if they used more than one kind of material; otherwise, there is no duplication. The tabulation of plants in some categories is subject to limitations. The large number of foundries and the small size of many of them make it impossible to obtain reports from all units. On the other hand, a few large corporations operating more than one plant prefer to file consolidated reports, in which the number and

TABLE 3.—Number and classification of plants consuming nonferrous scrap metals, refined copper, and copper-alloy ingots in 1950

Kind of plant	Type of materials used				
	Aluminum	Copper	Lead and tin	Zinc	All nonferrous types
Primary producers	[1] 32	16	8		
Secondary smelters	[2] 74	[3] 108	265	125	
Distillers				[4] 25	
Chemical plants	15	52		24	
Brass mills		53			
Wire mills		[5] 14			
Foundries and miscellaneous manufacturers			30	[6] 77	[7] 2,700

[1] Includes aluminum reduction plants and rolling mills.
[2] Includes 71 aluminum-alloy ingot makers and 3 naval air stations.
[3] Includes 72 secondary copper smelters and 36 smelters using copper scrap in other than copper alloys.
[4] Includes 16 secondary plants, including zinc-dust plants, and 9 primary producers which used scrap in addition to ore.
[5] Refers to companies operating wire mills. Some companies operate more than 1 plant.
[6] Includes galvanizers, die casters, and zinc rolling mills.
[7] Chiefly brass foundries, but some aluminum foundries, iron foundries, steel plants, and miscellaneous manufacturers. Any or all types of nonferrous scrap were used by these consumers. Figure shown is the number of plants on Bureau of Mines mailing list. Reports received are estimated to account for about 80 percent of the total foundry output.

location of plants are not given, with the result that only one plant is credited. These limitations, however, do not affect seriously the validity of the data presented.

The statements from industry, on which data in this chapter are based, are received monthly from the larger smelters, chemical plants, and manufacturers and from brass and wire mills. Foundries, primary aluminum producers, and smaller plants of other types are canvassed on an annual basis.

Definitions of terms used in this chapter follow:

Secondary metals are metals or alloys recovered from scrap and residues. The term "secondary" applies only to the source of the metal and has no relation to the type of product recovered, either as to quality, degree of purity, or physical characteristics.

Scrap metals are divided into three main categories: Old scrap, process (or plant) scrap, and defective finished or semifinished articles returned by purchasers to be reworked.

Old scrap consists of metal articles that have been discarded because of wear, damage, or obsolescence, usually after serving a useful purpose. Typical examples of old scrap are discarded trolley wire, battery plates, railroad-car boxes, fired-cartridge cases, automobile crank cases, used pipe, lithographers' plates, and obsolete military equipment (frequently unused).

Process scrap, or *plant scrap*, is that generated during the manufacture of articles for ultimate consumption. Typical examples of process scrap are clippings, turnings, borings, skimmings, slags, and drosses.

Process scrap is divided into two classifications: *Home scrap*, consumed in the plant of generation, and *new scrap*, which is consumed elsewhere, either after sale to another company or shipment to another plant of the same company.

Defective articles, the third main class of scrap, are classed as new scrap for tabulation purposes. In this chapter consumption of old and new scrap only is tabulated, no record being kept, in nonferrous metal canvasses, of home scrap. Scrap generated in a machine shop and consumed in a foundry at the same plant location is considered home scrap, and its consumption is not tabulated. Consumption of scrap is always measured at the point where it loses its identity as scrap and becomes secondary metal.

Borings and turnings and other items of process scrap, when consumed outside the plant where generated, are new scrap, whether clean, rusty, or oily and whether generated recently or long before reclamation. Residues are new scrap if generated in processing scrap or refined metal. For example, flue dust from smelting brass scrap is new scrap. Zinc-chemical residues resulting from the consumption of zinc dust in the manufacture of sodium hydrosulfite are also new scrap. On the other hand, residues generated in processing ore or concentrates are not scrap but "primary residue." Old mine tailings are primary residue because generated in processing ore.

SECONDARY ALUMINUM

The recovery of secondary aluminum from scrap totaled 243,666 short tons valued at $80,068,648, a 35-percent increase in quantity from the 180,762 tons, valued at $57,012,335, reclaimed from scrap processed in 1949. These values are calculated on the basis of the average prices received by producers of primary pig, which were 15.77 cents in 1949 and 16.43 cents in 1950.

TABLE 4.—Aluminum recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable aluminum-alloy content of scrap processed		
Kind of scrap	**1949**	**1950**
New scrap:		
Aluminum-base [2]	135,789	166,891
Copper-base	82	134
Zinc-base	99	135
Magnesium-base	196	148
Total	136,166	167,308
Old scrap:		
Aluminum-base [3]	44,030	75,616
Copper-base	134	104
Zinc-base	309	429
Magnesium-base	123	209
Total	44,596	76,358
Grand total	180,762	243,666

Aluminum recovered [1] from scrap processed		
Form of recovery	**1949**	**1950**
As metal	343	2,140
Aluminum alloys	178,502	239,577
In brass and bronze	450	270
In zinc-base alloys	600	868
In magnesium alloys	426	480
In chemical compounds	441	331
Grand total	180,762	243,666

[1] In accordance with common usage, the term "aluminum" covers aluminum alloys, and the figures include all constituents of the alloys recovered from aluminum-base scrap.
[2] Recoverable aluminum content of new aluminum-base scrap was 128,012 tons in 1949 and 156,978 tons in 1950.
[3] Recoverable aluminum content of old aluminum-base scrap was 41,194 tons in 1949 and 70,981 tons in 1950.

The recoverable aluminum-alloy content of old nonferrous scrap consumed increased 71 percent to 76,358 tons from 1949 to 1950, and that of new nonferrous scrap 23 percent to 167,308 short tons, although the increase in gross tonnage was about the same in each case. As usual, over 99 percent of the aluminum recovered was used in aluminum products.

Production of all types of aluminum-alloy ingot increased in 1950, except miscellaneous ingot, which is recorded as minus 10,347 tons because of large receipts of foreign scrap melted into ingot form abroad for greater convenience in transportation. This material was tabulated by the Bureau of Mines as purchased ingot rather than as scrap consumed, under the rule that consumption of scrap should be recorded at the point where it loses its identity as scrap. This imported material appears as negative production when received and as positive production when converted to specification ingot. Most of the ingot classed as miscellaneous is metal of such composition that it must be remelted and its composition changed by the addition of other metal.

Output of copper-silicon aluminum alloys (each over 2.5 percent Si) increased 37,739 tons in 1950, and that of ingot and shot for deoxidizing and other dissipative uses rose 16,058 tons. The total recorded 1950 production of ingot was 53 percent greater than in 1949. Primary aluminum producers increased their secondary recovery 4 percent, and the foundries' output of secondary aluminum in castings rose from 3,872 tons in 1949 to 11,439 tons in 1950.

TABLE 5.—Production of secondary aluminum and aluminum-alloy products in the United States, 1948–50, gross weight in short tons

Product	1948	1949	1950
Secondary aluminum ingot:[1]			
Pure aluminum (98.5 percent)	2,328	326	2,105
Silicon (max. Cu, 1 percent)	11,786	7,376	10,393
Silicon (Cu, 1 to 2.5 percent)	4,694	3,532	5,395
No. 12 aluminum	19,509	10,605	18,063
Other aluminum-copper (max. Si, 2.5 percent) alloys	[2] 17,612	[3] 1,955	[4] 6,043
Copper-silicon (each over 2.5 percent) alloys	80,940	52,900	90,639
Aluminum-copper- or aluminum-silicon-nickel alloys	3,791	5,152	7,466
Deoxidizing and other dissipative uses	34,143	23,828	39,886
Aluminum-base hardeners	3,989	2,209	4,697
Al-Mg and Al-Zn alloys	2,860	2,731	4,907
Miscellaneous	8,387	6,892	[5] −10,347
Total	190,039	117,506	179,247
Secondary aluminum recovered by primary producers	93,159	61,990	64,667
Aluminum powder[6]	56	17	35
Aluminum-alloy castings	5,289	3,872	11,439
Aluminum in chemicals	506	441	331

[1] Gross weight, including copper, silicon, and other alloying elements; total secondary aluminum and aluminum-alloy ingot contained 3,033 tons of primary aluminum in 1948, 2,206 tons in 1949, and 5,339 tons in 1950.
[2] Includes 13,766 tons produced at Naval Air Stations and plants of contractors melting down army planes.
[3] Includes 1,785 tons produced at Naval Air Stations.
[4] Of the total, 1,810 tons were produced at Naval Air Stations and United States Air Force bases.
[5] Negative production indicates consumption of this material at smelters greater than production.
[6] Does not include production measured as ingot for graining, powder, atomizing, or chemical purposes.

Consumption of all types of aluminum scrap advanced in 1950, the total being 273,192 tons compared with 199,039 tons in 1949. The most important increases were in the use of most kinds of old scrap by the secondary smelters and foundries. Consumption reported by the foundries was higher partly because many aluminum foundries that had not previously filed reports with the Bureau of Mines did so for 1950. Aluminum foundries consumed 5 percent of the total aluminum scrap used in 1950, whereas the brass foundries consumed 12 percent of the copper-base scrap reported as used. The latter can be used more conveniently at a foundry than aluminum scrap, because the composition of brass and bronze scrap and ingot can usually be determined accurately enough by visual inspection of a fresh surface, whereas different aluminum alloys have much the same appearance.

TABLE 6.—Consumption of old and new aluminum scrap in the United States in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries				Total scrap used
			Aluminum rolling mills and reduction plants		Foundries and other manufacturers		
	New scrap	Old scrap	New scrap	Old scrap	New scrap	Old scrap	
Pure clippings, wire, and foil	14,514	2,929	17,352	679	919	115	36,508
Castings and forgings	17,018	17,074	2,510	424	2,437	3,889	43,352
Alloy sheet	27,611	7,612	37,953	1,464	265	45	74,950
Scrap sheet and sheet utensil	------	9,281	1,206	1,197	168	4,174	16,026
Borings and turnings	37,573	------	2,625	------	489	------	40,687
Aircraft scrap	------	16,498	------	2,295	------	------	18,793
Miscellaneous aluminum and dross	18,255	23,682	98	513	101	227	42,876
Total	114,971	77,076	61,744	6,572	4,379	8,450	273,192

At aluminum plants where much scrap is used, more chemical or spectroscopic analysis is thus necessary than is economical at most foundries. Therefore, aluminum foundries in general rely more on alloy ingot as raw material than do brass foundries.

The secondary smelters apparently more than held their own in the competition with the primary producers for scarce scrap, increasing their consumption of aluminum 49 percent or 63,575 tons, compared with 4 percent or 2,714 tons by the primary plants. It is difficult to compare the operations of the primary plants with those of the secondary smelters. In some cases the former have foundries on the same sites with smelters or may have plants manufacturing aluminum-wrought products adjacent to rolling mills. In such instances scrap generated in the foundry or factory and consumed in the smelter or rolling mill is classified as home scrap and not reported. Where the foundry or factory is some distance from the smelter or rolling mill, process scrap generated at the first two and shipped to either of the second pair is classified as new scrap, regardless of plant ownership. Secondary aluminum smelters, except those owned by the primary producers, are not usually operated in connection with aluminum foundries or factories.

Detailed information on primary aluminum may be found in the Aluminum chapter of this volume.

TABLE 7.—Consumers' stocks of aluminum-base scrap in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Castings and forgings	2,792	2,422
Sheet, turnings, clippings, etc	12,917	11,774
Aircraft scrap	2,212	1,340
Miscellaneous aluminum and dross	2,244	1,723
Total	20,165	17,259

Dealers' buying prices for cast aluminum scrap averaged 7.75 cents a pound in January. The lowest monthly average was 7.25 cents in April, after which it rose each month for the remainder of the year; the December average was 15.75 cents and the annual average 10.10 cents. Prices for new aluminum clippings followed the same pattern in 1950 as those for castings scrap, the average price for January being 10.75 cents, for April 10.25 cents, for December 19.25 cents, and for the year 13.16 cents.

The monthly average price of secondary aluminum ingot (No. 12 alloy, at New York, as quoted by the American Metal Market) was 16.50 cents a pound in January, was lowest in March at 15.88 cents, and increased to 30.75 cents in December, the average for the year being 21.08 cents compared with 17.35 cents in 1949. The price of primary aluminum pig (New York American Metal Market), was 17 cents a pound at the beginning of the year, increased May 19 to 17.50 cents, September 25 to 18.25 cents, and October 3 to 19 cents, the average for the year being 17.69 cents.

Imports of aluminum scrap, most of which were actually in ingot form, in 1950 were 67,959 tons compared with 40,120 tons in 1949. Exports were 800 tons in 1950 and 397 tons in 1949.

SECONDARY ANTIMONY

Recovery of secondary antimony in 1950 from lead- and tin-base scrap totaled 21,862 short tons valued at $12,859,228, representing an increase of 21 percent in quantity but a decrease of 8 percent in value from the 18,061 tons, valued at $13,990,051, recovered in 1949. The value was computed at 38.73 cents per pound in 1949 and 29.41 cents in 1950, the average New York selling price.

Of the total secondary antimony recovered, 20,208 tons was reclaimed at secondary copper and lead smelters and 1,654 tons at primary lead refineries.

TABLE 8.—Secondary antimony recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable antimony content of scrap processed			Antimony recovered from scrap processed		
Kind of scrap	1949	1950	Form of recovery	1949	1950
New scrap:			In antimonial lead	11,566	13,326
Lead-base	3,085	3,091	In other lead alloys	6,311	8,299
Tin-base			In tin-base alloys	184	237
Total	3,085	3,091	Grand total	18,061	21,862
Old scrap:					
Lead-base	14,809	18,602			
Tin-base	167	169			
Total	14,976	18,771			
Grand total	18,061	21,862			

Consumption of battery plates rose 11 percent above the quantity used in 1949 and yielded 50 percent of all secondary antimony reclaimed. Antimony reclaimed in antimonial lead, in other lead-base alloys, and in tin-base alloys increased in 1950. Lead remelters, smelters, and refiners recovered 97 percent of the total and manufacturers and foundries the remaining 3 percent. Data on consumption of scrap from which antimony was reclaimed may be found in the tables on consumption of lead- and tin-base scrap in the sections of this chapter devoted to those metals. Products in which antimony was recovered are included in the lead- and tin-products table of this chapter, under the heading Secondary Lead. All the secondary antimony recovered in 1950, 21,862 tons, was used in metal products. Of the 15,494 tons of primary consumed in 1950, 9,626 tons were used in metal products. As far as could be determined, all secondary antimony was reclaimed in lead and tin alloys. Detailed information on primary antimony is given in the Antimony chapter of this volume.

Light consumer demand and availability of foreign metal at a lower price caused the price of domestic antimony to drop from an average of 31.70 cents a pound in January to 26.43 cents in August. In September the average monthly price rose to 32.80, and in October it advanced to 33.78, where it remained to the end of the year.

SECONDARY COPPER AND BRASS

The recovery of secondary copper from all classes of nonferrous scrap totaled 977,239 short tons valued at $406,531,424 in 1950, an increase of 37 percent in quantity over the 713,143 tons valued at $280,978,342 recovered in 1949. These values are computed at the average weighted price for all grades of refined copper sold by producers in the 2 years, that is, 19.7 cents in 1949 and 20.8 cents in 1950.

The uptrend in copper-base-scrap operations at secondary copper smelters, brass mills, and foundries, which began in the latter half of 1949, continued in 1950. Demand for copper products was at a high level due to national prosperity and increased when the Korean situation superimposed new military requirements upon those of the civilian economy. Recovery of copper from new scrap increased more than that from old (49 percent compared with 27) because heightened industrial activity increased the generation of plant scrap.

TABLE 9.—Copper recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable copper content of scrap processed: Kind of scrap	1949	1950	Copper recovered from scrap processed: Form of recovery	1949	1950
New scrap:			As unalloyed copper:		
Copper-base	323,666	485,054	At primary plants	212,392	189,746
Aluminum-base	5,293	6,765	At other plants	37,697	70,958
Nickel-base	633	203			
Lead-base			Total	250,089	260,704
Zinc-base	3	6			
			In brass and bronze	436,457	679,849
Total	329,595	492,028	In alloy iron and steel	1,552	2,381
			In aluminum alloys	9,951	16,621
Old scrap:			In other alloys	254	271
Copper-base	381,491	481,449	In chemical compounds	14,840	17,413
Aluminum-base	1,450	2,299			
Nickel-base	436	1,362	Total	463,054	716,535
Lead-base	73	2			
Tin-base	97	97	Grand total	713,143	977,239
Zinc-base	1	2			
Total	383,548	485,211			
Grand total	713,143	977,239			

Secondary copper smelters and brass mills produced approximately equal quantities of copper from scrap in 1949 and each group about two-thirds more in 1950. Primary producers' output of secondary copper declined from 215,214 tons in 1949 to 195,441 in 1950. Brass foundries increased their recovery of copper from copper-base scrap from 85,056 tons in 1949 to 116,767 in 1950.

The decrease in secondary output by the primary producers was caused by the relationship between prices for virgin metal and scrap. Rises in prices for nonferrous primary metals were voluntarily held to a minimum by the producers as a means of stabilizing the market. The price of copper scrap purchased by primary plants depended largely on the price of copper, while that purchased by the ingot makers depended on the more flexible prices of brass ingots. Normally, primary refiners buy a large proportion of the available copper scrap to make into refined copper, whereas the ingot makers buy a smaller proportion for alloying purposes. Primary producers' use of

TABLE 10.—Copper recovered from copper-base scrap processed in 1949–50, in short tons

	From new scrap		From old scrap		Total copper recovered	
	1949	1950	1949	1950	1949	1950
By secondary copper smelters	47,407	74,719	150,218	251,861	197,625	326,580
By primary copper producers	82,617	88,298	132,597	107,143	215,214	195,441
By brass mills	180,186	298,112	12,268	19,310	192,454	317,422
By foundries	13,027	23,269	72,029	93,498	85,056	116,767
By chemical plants	429	656	14,379	9,637	14,808	10,293
Total	323,666	485,054	381,491	481,449	705,157	966,503

unalloyed scrap declined from 140,142 tons in 1949 to 114,314 in 1950; ingot makers' consumption of this scrap rose from 65,352 tons in 1949 to 110,551 in 1950. The unusual condition may be attributed in part to the general scrap scarcity. In 1950 ingot makers frequently bought unalloyed copper scrap for use in making alloy ingot when they would have preferred brass or bronze scrap so that they could avoid the expense of purchasing zinc, tin, etc., to melt with the unalloyed scrap. Ingot makers are secondary smelters that normally produce copper-alloy ingot chiefly from copper-alloy scrap rather than from unalloyed primary metals or scrap.

TABLE 11.—Consumption of old and new copper scrap in the United States in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries: Brass mills		Manufacturers and foundries: Foundries, chemical plants, and other manufacturers		Total scrap used
	New scrap	Old scrap	New scrap	Old scrap	New scrap	Old scrap	
No. 1 wire and heavy	33,874	53,688	32,089	2,652	6,319	17,920	146,542
No. 2 wire, mixed heavy, and light	41,367	95,936	40,556	5,222	3,542	4,773	191,396
Composition or red brass	50,996	65,919			12,864	22,394	152,173
Railroad-car boxes		1,001				62,236	63,237
Yellow brass	18,736	62,385	310,682	3,206	5,047	9,469	409,525
Cartridge cases	14	1,678	484	13,354	2	68	15,600
Auto radiators (unsweated)		45,551				397	45,948
Electrotype shells		1,006				30	1,036
Bronze	7,694	27,541	1,368	2	1,006	10,910	48,521
Nickel silver	224	4,482	16,128	113	90	23	21,060
Low brass	2,169	150	20,770	185	331	2,044	25,649
Aluminum bronze	85	640	176		180	170	1,251
Low-grade scrap and residues	99,681	217,507				2,046	319,234
Total	[1] 254,840	[1] 577,484	422,253	24,734	[2] 29,381	[2] 132,480	1,441,172

[1] Of the totals shown, primary refiners reported the following: Unalloyed copper scrap, 68,554 tons of new and 45,760 tons of old; low-grade scrap and residues, 71,990 tons of new and 199,356 tons of old.
[2] Of the totals shown, chemical plants reported the following: Unalloyed copper scrap, 704 tons of new and 9,822 tons of old; copper-base alloy scrap, 26 tons of new and 185 tons of old.

The low-grade scrap and residues consumed by the primary smelters consist chiefly of refinery brass, brass ashes and skimmings, foundry residues, and irony brass, the latter consisting of such objects as old radio sets, appliances with brass and iron parts, and motor armatures. The irony brass can be used more economically by primary smelters than by other consumers because the iron may be used in forming the matte, a mixture of iron and copper sulfides, which is an intermediate product in the operation of a primary copper smelter.

Most primary plants make copper matte in reverberatory furnaces, but where large quantities of skimmings, scrap contaminated with iron, and other low-grade items are consumed a blast furnace is sometimes used. Sulfur for the matte is provided by mixing ore or concentrates with the scrap, the concentrates usually being sintered before smelting. Iron for the matte may be provided by the irony scrap, iron in the concentrates, scrap iron, or other sources. Iron is also a necessary constituent of the slag, but before it can form the latter by combining with lime and silica it must be oxidized. The atmosphere of a blast furnace is normally reducing, but when oxides of copper and other metals are present in the charge the iron absorbs enough oxygen from them to enter the slag. The composition of the charge must be planned so that the quantities of copper, iron, lime, silica, sulfur, and oxygen will be in balance. The same results can also be obtained by using a reverberatory furnace, which some metallurgists prefer to the blast furnace. Advantages claimed for the blast furnace are continuity of operation (contrasted with cyclic operation of the reverberatory furnace), greater facility in charging, and greater flexibility, which means that wider variation in composition of the charge is allowable.

After removal from the blast or reverberatory furnace, the matte is treated in a converter where scrap, including irony material, may also be added, the iron, as well as the sulfur, providing fuel for the reaction. When the sulfur and iron have been burned off, the resulting blister copper is further refined in a reverberatory where unalloyed scrap may be added. The next step is electrolytic refining, from which the copper emerges as cathodes for further refining in another reverberatory furnace and casting in refinery shapes. In this furnace only high-grade unalloyed scrap may be added. Oxidation of the last impurities is promoted by blowing with air, producing a copper oxide slag which is skimmed off and sent back to the blast furnace. Here the iron reduces the copper oxide to copper, which then enters the matte as copper sulfide. The iron is oxidized and enters the slag as a calcium iron silicate. Plants classed as primary smelters at times consume more scrap than primary material, but if any sulfur-bearing ores or concentrates are used in conjunction with the scrap, the primary plant procedure of making a matte is followed.

Some secondary copper smelters operate blast furnaces or cupolas to smelt low-grade irony scrap; but if they use no sulfur-bearing material no matte is made, and the product of the blast furnace is then black copper, an impure metallic alloy requiring further furnace treatment. The iron may be oxidized for slagging by adding oxides to the charge, such as are contained in slag from a reverberatory furnace or brass ashes and skimmings. The use of blast furnaces at primary copper smelters has decreased since introduction of the flotation process, which has increased the proportion of fines in primary raw materials smelted; but the blast furnace and cupola still compete with the reverberatory furnace at secondary smelters and at primary plants where large quantities of low-grade contaminated scrap are treated.

Most foundries are small compared with smelters. They melt brass ingot or scrap in crucibles or small melting furnaces to make castings and are usually better-equipped to use ingot than scrap. When ingot is not obtainable in sufficient quantities, however, they naturally compete for the available scrap. Some large foundries use scrap almost entirely; others use nothing but ingot. It is, of course, feasible for a foundry to operate a smelter or a smelting department to provide its own ingots. Foundries often have access to scrap supplies through their customers, the plumbing-supply companies, which may obtain worn-out plumbing articles from their customers, in turn, as part payment on replacements.

Primary copper smelters and refiners produced 189,746 tons of electrolytic grade and casting copper and a minor quantity of chemicals from scrap in 1950 compared with 212,392 tons of copper and a similar quantity of chemicals in 1949. The secondary copper smelters' output in 1950, including brass ingot, brass and copper billets for

TABLE 12.—Analysis and production of secondary copper and copper-alloy products in the United States, 1949–50

Item produced from scrap	Approximate analysis (percent)						Gross weight produced (short tons)	
	Cu	Sn	Pb	Zn	Ni	Al	1949	1950
Unalloyed copper products:								
Refined copper (electrolytic grade)	100						211, 169	186, 122
Casting copper	99						17, 245	20, 439
Copper sheet, rod, tubing, etc	99						17, 323	48, 421
Copper powder	98						2, 273	4, 376
Copper castings	98						2, 079	1, 346
Total							250, 089	260, 704
Brass and bronze ingots:								
Tin bronze	88	10		2			12, 562	19, 193
Leaded-tin bronze	88	6	1. 5	4. 5			10, 689	18, 936
Leaded red brass	85	5	5	5			71, 813	125, 461
Leaded semired brass	81	3	7	9			38, 427	68, 718
High-leaded-tin bronze	80	10	10				14, 788	26, 648
Do	84	6	8	2			4, 592	9, 668
Do	75	5	20				5, 457	6, 615
Leaded yellow brass	66	1	3	30			17, 662	28, 105
Manganese bronze	62			27		5	9, 670	12, 666
Aluminum bronze	89					10	2, 200	5, 018
Nickel silver	58	2	17	18	14		3, 399	4, 276
Do	65	4	3	5	22			
Low brass	80			20			1, 812	2, 895
Silicon bronze	92			4			2, 233	3, 240
Conductor bronze	94	2	2	2			399	584
Hardeners and special alloys	81						4, 343	8, 664
Total [1]							200, 046	340, 687
Brass-mill billets made by ingot makers							2, 641	2, 828
Brass and bronze sheet, rod, tubing, etc.[2]							265, 439	418, 571
Brass and bronze castings [3]							99, 419	131, 963
Brass powder							886	906
Copper in chemical products (content)							14, 840	17, 413

[1] Gross weight of brass and bronze ingot. Includes 158,000 tons of copper, 6,364 tons of lead, 439 tons of nickel, 5,693 tons of tin, 25,665 tons of zinc, 64 tons of aluminum, and 3,821 tons of primary metals in 1949; and 276,646 tons of copper, 11,726 tons of lead, 659 tons of nickel, 10,321 tons of tin, 37,266 tons of zinc, 103 tons of aluminum, and 3,966 tons of primary metals in 1950.

[2] Gross weight of secondary brass and bronze in commercial shapes. Includes 189,027 tons of copper, 2,187 tons of nickel, 3,053 tons of lead, 221 tons of tin, 70,800 tons of zinc, and 151 tons of aluminum in 1949; and 298,930 tons of copper, 2,904 tons of nickel, 4,646 tons of lead, 467 tons of tin, 111,499 tons of zinc, and 125 tons of aluminum in 1950.

[3] Gross weight of secondary metal in brass and bronze castings. Includes 78,059 tons of copper, 45 tons of nickel, 10,381 tons of lead, 4,045 tons of tin, 6,727 tons of zinc, and 162 tons of aluminum in 1949; and 104,709 tons of copper, 74 tons of nickel, 13,735 tons of lead, 5,591 tons of tin, 7,812 tons of zinc, and 42 tons of aluminum in 1950.

brass mills, refined copper, copper powder, copper shot, and copper chemicals, totaled 394,665 tons gross weight, or 60 percent more than in 1949. Brass mills recovered 436,701 tons of nonferrous metals, including copper, tin, lead, zinc, and aluminum, from scrap in 1950 compared with 269,577 tons in 1949, an increase of 62 percent. The smelters' recovery of secondary copper was a little greater than that of the brass mills, but the total secondary recovery of the brass mills was greater because their scrap contained a greater proportion of zinc and metals, other than copper, than the scrap consumed by the smelters. The scrap used and the alloys produced by ingot makers average much higher in copper than brass-mill material.

The ingot produced at the smelters is used chiefly for castings. It contains tin to make the alloy nonporous and resistant to pressures. Without tin, pipes and valves filled with liquid or vapor under pressure would sweat; tin also resists corrosion. Lead makes casting alloys easy to machine, but in sheet brass it causes soft spots. Tin in sheet brass causes season cracking around grain boundaries. The chief alloys for wrought-brass products are those containing about two-thirds copper and one-third zinc.

TABLE 13.—Consumption of copper and brass materials, by principal consuming groups, in short tons, 1949–50

Item consumed	Primary producers	Brass mills	Wire mills	Foundries and other manufacturers	Secondary smelters
1949					
Copper-base scrap	415,498	275,559		131,093	273,987
Primary material	[1] 927,927				
Refined copper		478,126	677,223	21,808	4,463
Brass ingot		632	2,204	201,339	
Slab zinc		79,624			
Miscellaneous		968			9,015
1950					
Copper-base scrap	385,660	446,987		151,124	446,664
Primary material	[1] 1,239,834				
Refined copper		675,100	713,354	26,649	6,209
Brass ingot		1,936	1,834	343,428	
Slab zinc		129,535			
Miscellaneous		1,193			16,143

[1] Recoverable copper content; gross weight not available.

It will be noted from table 13, showing estimated consumption of copper materials by principal consuming groups, that the primary producers' decrease in consumption of scrap was much more than counter-balanced by their increased use of primary raw material. The brass mills and secondary smelters had about the same scrap consumption in 1950 and the same increase over 1949 consumption. The former group increased its use of refined copper 41 percent, whereas its scrap consumption increased 62 percent. Consumption of refined copper by wire mills rose 5 percent. Foundries' consumption of scrap rose 15 percent and of brass ingot 71 percent in 1950 over 1949.

Consumption of brass ingot actually reported by foundries responding to Bureau of Mines questionnaires was 69 percent greater in 1950 than in 1949, totaling 273,433 short tons compared with

162,188 tons. In addition to the 273,433 tons reported by the foundries, 3,823 tons were consumed by brass and wire mills, and 531 tons were exported. Data on imports of brass ingot are not readily available, but of the 23,486 tons of brass scrap imported in 1950 much was probably melted into ingot form abroad for convenience in transportation. Brass ingot makers shipped 343,959 tons of brass ingot to foundries in 1950 and 204,969 tons in 1949. On the assumption that shipments equal domestic consumption plus exports, the foundry consumption survey achieved 80 percent coverage in 1950 compared with 81 percent in 1949. Over 3,300 plants were canvassed both years.

In table 14 ingot consumption reported in the 1950 foundry survey has been classified by nine general types and by States and geographic divisions. Similar breakdowns for earlier years have been published in past Minerals Yearbooks. As in 1949, the geographic division containing Ohio and Illinois consumed more than any other division—128,637 tons—and Ohio more than any other State—45,560 tons. The division using the next largest total, 70,621 tons, was the Middle Atlantic, in which the New York metropolitan area lies. These two regions together consumed 73 percent of the total quantity used by foundries. Consumption of composition ingot, the largest item, amounted to 169,166 tons, or 62 percent of the total.

TABLE 14.—Foundry consumption of brass ingot in 1950 by geographic division and States, in short tons

Geographic division and State	Tin bronze	Leaded tin bronze	Leaded red brass	High leaded tin bronze	Leaded yellow brass	Manganese bronze	Hardeners	Nickel silver	Low brass	Total
New England:										
Connecticut	312	3,730	5,015	856	2,604	216	9	4	96	12,842
Maine	11	7	193	40	3	39	4		20	317
Massachusetts	758	2,397	5,361	568	548	431	16	47	171	10,297
New Hampshire	18	42	830	130	834	11	1	40	4	1,910
Rhode Island	30	244	615	57	36	1	3		33	1,019
Vermont			113	1						114
Total	1,129	6,420	12,127	1,652	4,025	698	33	91	324	26,499
Middle Atlantic:										
New Jersey	1,182	1,087	5,704	78	809	257	8	30	180	9,335
New York	1,301	4,500	12,638	1,014	325	1,147	100	239	555	21,819
Pennsylvania	2,102	5,093	21,965	1,470	2,703	2,885	2,028	131	1,090	39,467
Total	4,585	10,680	40,307	2,562	3,837	4,289	2,136	400	1,825	70,621
East North Central:										
Illinois	934	3,088	21,571	763	871	1,323	223	312	840	29,925
Indiana	163	248	10,953	897	200	242	467	27	37	13,234
Michigan	237	3,736	16,963	767	1,963	820	274	5	55	24,820
Ohio	2,124	10,110	27,883	3,307	561	748	118	83	626	45,560
Wisconsin	675	1,401	7,206	1,321	3,329	419	15	635	97	15,098
Total	4,133	18,583	84,576	7,055	6,924	3,552	1,097	1,062	1,655	128,637
West North Central:										
Iowa	186	71	2,439	69	69	75		8	1	2,918
Kansas	5	1	93		289	20	1			409
Minnesota	274	534	2,492	59	275	60	4		16	3,714
Missouri	289	494	2,695	33	1,730	56	66	1	222	5,586
Nebraska and South Dakota	1	148	335			4	8			496
Total	755	1,248	8,054	161	2,363	215	79	9	239	13,123

TABLE 14.—Foundry consumption of brass ingot in 1950 by geographic divisions and States, in short tons—Continued

Geographic division and State	Tin bronze	Leaded tin bronze	Leaded red brass	High leaded tin bronze	Leaded yellow brass	Manganese bronze	Hardeners	Nickel silver	Low brass	Total
South Atlantic:										
Delaware	23	1	356	13		4			4	401
Florida	6	20	27	5		13				71
Georgia	4	368	117	3					2	494
Maryland and District of Columbia	51	339	477	129		14	10		30	1,050
North Carolina	6		27		315		2			350
South Carolina	6	13	4			4				27
Virginia	99	462	96	85	183	52	18		2	997
West Virginia	1	80	4,763	1	219	1				5,065
Total	196	1,283	5,867	236	717	88	30		38	8,455
East South Central										
Alabama	70	277	3,236	76	354	386	50	22	153	4,624
Kentucky	5	179	110	6	19		1		4	324
Mississippi	7		14							21
Tennessee	120	505	579	60	128	24	4	2		1,422
Total	202	961	3,939	142	501	410	55	24	157	6,391
West South Central										
Arkansas	2		4							6
Louisiana	10	8	60	9		10			6	103
Oklahoma	271	408	101	47		9	1			837
Texas	82	350	1,285	17	3	185	2		36	1,960
Total	365	766	1,450	73	3	204	3		42	2,906
Mountain:										
Arizona and New Mexico		8	13							21
Colorado	63	46	37	78	2	13			5	244
Idaho	7									7
Montana							3			3
Utah		19	23			2				44
Total	70	73	73	78	2	15	3		5	319
Pacific:										
California	400	1,089	12,624	712	362	472	15	17	342	16,033
Oregon	10	102	107		12	15				246
Washington	60	54	42	5	3	38	1			203
Total	470	1,245	12,773	717	377	525	16	17	342	16,482
Grand total	11,905	41,259	169,166	12,676	18,749	9,996	3,452	1,603	4,627	273,433

Consumer's stocks of copper-base scrap at the end of 1950 were little changed from those at the end of 1949, except for increased holdings of low-grade material by primary producers. However, during most of 1949 stocks at secondary smelters were well above 30 days supply, whereas during all of 1950 they were considerably below monthly consumption.

TABLE 15.—Consumers' stocks of copper-base scrap in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Unalloyed copper	12,937	16,674
Copper-base alloy	46,011	41,826
Low-grade scrap and residues	34,999	60,702
Total	93,947	119,202

Dealers' buying prices for No. 1 composition scrap increased from 11.12 cents in January to 18.87 cents in November, then declined to 17.15 cents in December, the average for the year being 14.31 cents. The price of this scrap followed the price of copper at a level approximately 8 cents lower. The price of No. 1 heavy copper scrap averaged 13.62 cents in January through March, then increased to 24.75 cents in November, declining to 20.25 cents in the final month of 1950, the average for the year being 17.67 cents.

TABLE 16.—Brass and copper scrap imported into and exported from the United States, 1946–50, in short tons

	1946	1947	1948	1949	1950
Imports for consumption:					
Brass scrap	4, 008	112, 393	59, 984	23, 486	38, 092
Scrap copper	1, 030	5, 957	9, 334	6, 765	31, 409
Exports:					
Brass scrap	1, 184	3, 157	6, 584	13, 963	9 004
Scrap copper	909	969	2, 266	8, 284	9, 445

SECONDARY LEAD

Lead recovery reported by secondary smelters increased from 412,183 tons valued at $130,249,828 in 1949 to 482,275 tons valued at $130,214,250 in 1950; this represents a quantity gain of 17 percent. However, about half of the apparent increase in scrap recovery in 1950 was due to greater coverage of the survey. The companies that failed to report lead scrap operations to the Bureau of Mines in previous years did so in 1950. Another 15 percent of the gain was attributable to increased use of copper-base scrap, some types of which contain appreciable percentages of lead. The gain in recovery at lead plants reporting for both 1949 and 1950 was about 26,000 tons.

Value of lead recovered has been computed for both years on the basis of the yearly average weighted prices of all grades of refined lead sold by producers, or 15.8 cents in 1949 and 13.5 cents in 1950. For the

TABLE 17.—Lead recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable lead content of scrap processed			Lead recovered from scrap processed		
Kind of scrap	1949	1950	Form of recovery	1949	1950
New scrap:			As metal:		
Lead-base	42, 930	46, 370	At primary plants	23, 230	5, 455
Copper-base	5, 113	8, 385	At other plants	129, 396	123, 858
Total	48, 043	54, 755	Total	152, 626	129, 313
Old scrap:			In antimonial lead [1]	172, 742	225, 640
Battery lead plates	210, 611	242, 213	In other lead alloys	78, 894	107, 635
All other lead-base	138, 768	163, 398	In copper-base alloys	7, 440	18, 695
Copper-base	14, 738	21, 886	In tin-base alloys	481	992
Tin-base	23	23			
Total	364, 140	427, 520	Total	259, 557	352, 962
Grand total	412, 183	482, 275	Grand total	412, 183	482, 275

[1] Includes 32,705 tons of lead recovered in antimonial lead from secondary sources at primary plants in 1949 and 38,383 tons in 1950.

fifth successive year, recovery of lead from scrap was greater than domestic mine production.

Production of refined soft lead decreased 14 percent from 156,910 tons, with a secondary lead content of 152,626 tons, in 1949 to 135,178 and 129,313 tons, respectively, in 1950. However, antimonial lead produced increased 36 percent, with the secondary lead content advancing 31 percent. Lead recovered in solder rose 25 percent, in type metals 52 percent, and in lead-base babbitt 33 percent. Total output of the secondary lead industry increased 19 percent over 1949 owing to a 13-percent increase in the use of scrap and to a more than 100-percent increase in the use of primary metals. As shown in table 18, the gross weight for most items is considerably greater than the total secondary metal content. Most of the differences represent primary metal, added to melts of scrap to bring the composition up to specifications. In the case of antimonial lead, the difference between gross weight and total secondary metal content is 23,713 tons, which represents primary lead, primary antimony, and elements not listed in the table. In 1950 secondary smelters consumed 111,581 tons of primary lead, 7,425 tons of primary antimonial lead, 20,551 tons of primary and detinners' brand tin, 7,014 tons of primary antimony, and 399 tons of miscellaneous metals, in conjunction with scrap and secondary metals.

Primary lead refineries recovered 44,739 tons of lead from scrap in 1950 or 9 percent of the total lead reclaimed. Of this quantity, 5,455 tons were refined soft lead, 38,383 in antimonial lead, and 901 in solder, compared with 23,230, 32,705, and 917 tons, respectively, in 1949. Antimony content of the secondary antimonial lead recovered was 1,654 tons.

A total of 609,877 tons of lead-base scrap was treated in 1950. Use of battery-lead plates increased 33,341 tons (11 percent) from 1949 to 1950, soft lead 10,737 tons (21 percent), hard lead 16,936 tons (125 percent), mixed common babbitt 6,900 tons (38 percent), solder 8,812 tons (67 percent), and type metals 8,685 tons (60 percent). Use of cable-lead scrap dropped 27 percent, and there was a 3-percent decrease in the treatment of drosses and residues. Smelters' heaviest operations were in the last quarter of the year, reaching the highest point in October, with November and December following in that order. The lowest recovery of the year was in April.

Plates from worn-out batteries constitute about three-fifths of the total lead scrap used. In 1950 consumption of this material was 349,383 tons, or 57 percent of the total. A few primary lead plants smelt their plate scrap with ore or concentrates; some add plate scrap when smelting drosses to increase the lead in the charge, but usually in both primary and secondary plants the plates are treated separately.

When the product is to be antimonial lead, battery-plate scrap is treated in a blast furnace. Old plates have a coating of lead oxide, lead sulfate, and usually a little sulfuric acid. The impurities to be removed in the smelting operation, including the oxygen, the acid, and the separators, constitute about 30 percent of the total weight of scrap in the charge. The sulfur forms a matte with some of the lead, copper, and iron, the last being added as mill scale, cast iron, or iron oxide. The iron also enters the slag in combination with lime and

TABLE 18.—Shipments[1] of secondary lead, tin, and lead- and tin-alloy products in the United States in 1950, gross weight in short tons

Product	Gross weight of products[2]	Secondary metal content			
		Lead	Tin	Antimony	Copper
Refined pig lead	100,941	100,941			
Remelt lead	31,839	27,520			
Lead foil	2,398	852			
Total	135,178	129,313			
Refined pig tin	3,790		3,790		
Remelt tin	869		221		
Tin foil	77		38		
Total	4,736		4,049		
Lead and tin alloys:					
Antimonial lead	262,996	225,640	290	13,326	27
Common babbitt	37,291	26,288	1,735	2,854	133
Genuine babbitt	2,466	210	579	117	45
Other tin babbitts	1,960	782	294	120	25
Solder	101,893	39,756	9,195	518	8
Type metals	51,424	38,905	2,873	4,729	22
Miscellaneous lead-tin alloys	2,827	2,184	147	92	
Total	460,857	333,765	15,113	21,756	260
Composition foil	712	502	103	106	
Tin content of chemical products	701		701		

[1] Most of the figures herein represent shipments rather than production of the items involved. However, it has been necessary to record actual production figures in some instances where the information is secured from reports on that basis.
[2] Difference between gross weight of products and secondary metal content represents added primary metals or impurity content.

silica. The silica may be added as gravel, but much of it comes from the coke used. The copper comes from the copper terminal connections mixed with the plate scrap. In the reducing atmosphere of the blast furnace or cupola, the lead oxide is reduced to lead and, with the antimonial lead, gathers the silver, copper, and bismuth in the molten bath at the bottom of the furnace. The matte settles above the metal and slag above the matte. The matte is usually discarded, but the slag may be reused in subsequent charges. After the molten metal is drawn into a kettle, the copper is removed by the addition of sulfur. A small percentage of silver, about 0.025, is residual in battery plates and originates in the antimonial lead used in making the plates. It is not economical, even at primary plants, to desilverize antimonial lead unless the antimony is removed first.

In making soft lead from plate scrap, a reverberatory furnace is used. Some of the lead is changed, by blowing, to lead oxide, which oxidizes the antimony, forming an antimonial lead slag containing about 25 percent antimony, which may be returned to the blast furnace for production of antimonial lead. The antimony content of the soft lead may be reduced further by means of caustic soda. The silver cannot be economically separated at secondary smelters because the quantity recovered would not justify installation and operation of desilverizing equipment. The bismuth also is difficult to remove. These disadvantages hamper the secondary plants in competing with the primary producers in the production of the higher grades of refined lead. Data are not available to show how much of the refined lead produced from scrap at primary smelters and refineries was desilverized. Production of secondary refined lead at primary plants decreased to 5,455 tons in 1950, whereas output of antimonial lead, most of which was secondary, increased to 57,959 tons at these plants. Detailed information on primary lead is given in the Lead chapter of this volume.

TABLE 19.—Consumption of old and new lead scrap in the United States in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries		Total scrap used
	New scrap	Old scrap	New scrap	Old scrap	
Soft lead		61,151	15	1,769	62,935
Hard lead		29,722		815	30,537
Cable lead		29,764	16	47	29,827
Battery-lead plates		349,376		7	349,383
Mixed common babbitt		12,736	42	12,384	25,162
Solder and tinny lead		20,801	1,003	186	21,990
Type metals		23,142		111	23,253
Dross and residues	66,706		84		66,790
Total	66,706	526,692	1,160	15,319	609,877

Treatment of soft lead and solder scrap is essentially a remelting operation at secondary smelters. Type metal and babbitt scrap may be smelted together in a reverberatory furnace to produce either babbitt or type metal.

During the first 4 months of 1950 the market for lead was dull. During this period monthly consumption, as recorded in the lead-consumption survey, ranged from 75,548 tons in February to 86,626 in March, whereas in other months of the year usage ranged from 93,300 tons in July to 126,090 in October. Lead-scrap consumption followed about the same pattern as that of refined metal. A second mild winter had lightened operation of the battery industry, which consumes most of the antimonial lead produced by the secondary smelters, and was a factor in the small rate of use in the early months of the year. Also demand for lead in foreign countries had fallen, increasing the lead available for export to the United States. The latter, together with the low tariff on lead and devaluation of foreign currency, caused a record-breaking quantity of lead to be imported in 1950 and weakened the market for domestic metal. With the outbreak of the Korean War and the accompanying increase in industrial activity, prices and demand for both scrap and refined lead increased rapidly, and toward the end of the year the National Production Authority started regulatory controls limiting inventories as an antihoarding measure. Smelting charges on battery plates were high at $55 to $65 during the first quarter, gradually decreased to $25 in September, and rose slightly to $32.50 in late December, denoting the trend from plentiful to tighter supplies.

Percentage and remelt metals circulated among remelters, smelters, and refiners in 1950 totaled 37,658 tons, consisting of 4,320 tons of solder, 2,663 of lead-base babbitt, 7,174 of soft lead, 20,876 of antimonial lead, 1,576 of type metals, 828 of cable lead, 159 of tin-base babbitt, 59 of remelt tin, and 3 of pewter.

TABLE 20.—Consumers' stocks of lead-base scrap in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Unalloyed lead	3,713	2,998
Lead-base alloy	25,280	32,242
Drosses and residues	17,761	21,399
Total	46,754	56,639

Smelters' stocks of lead alloys and drosses gained 28 and 20 percent, respectively, during the year but were 19 percent lower in unalloyed lead. Inventories on December 31 totaled 56,639 tons, an over-all gain of 21 percent; and smelters' year-end stocks of secondary metals totaled 23,115 tons, a decrease of 15 percent.

The price of lead scrap and secondary lead depends upon the price of primary lead. Between August 1949 and April 1950 there were nine successive drops in the price of primary lead, reducing it from 15.125 cents a pound to 12.00 cents on January 1 and to 10.50 cents a pound on March 14. Thereafter, although there were two decreases in June, the trend was upward, and the price reached 17 cents on October 31, where it remained to the end of the year. Prices for heavy scrap lead followed very much the same trend on a level a little over 2¼ cents a pound lower; the average for the year was 10.90 cents.

General imports of lead scrap totaled 20,085 tons (lead content) in 1950 compared with 14,649 tons (lead content) in 1949.

SECONDARY MAGNESIUM

Secondary magnesium (including alloying ingredients) recovered from scrap in 1950 totaled 7,740 short tons valued at $3,410,244 compared with 5,962 tons valued at $2,444,420 in 1949. Values have been calculated at 20.5 cents a pound in 1949 and 22.03 cents in 1950, the average prices for magnesium ingot (98.5 percent), f. o. b. Freeport, Tex., for the 2 years. Primary production in 1950 was 15,726 tons, all from operations at the Freeport, Tex., plant of Dow Chemical Co.

TABLE 21.—Magnesium recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable magnesium-alloy content of scrap processed			Magnesium recovered [1] from scrap processed		
Kind of scrap	1949	1950	Form of recovery	1949	1950
New scrap: Magnesium-base	3,023	2,770	Magnesium-alloy ingot [2] (gross weight)	4,249	3,682
Old scrap:			Magnesium-alloy castings (gross weight)	681	2,504
Magnesium-base	2,837	4,798	Magnesium-alloy shapes	96	281
Aluminum-base	102	172	In aluminum alloys	294	810
Total	2,939	4,970	In zinc alloys	4	57
			Chemical and other dissipative uses	83	95
Grand total	5,962	7,740	Cathodic protection	555	311
			Grand total	5,962	7,740

[1] Includes alloying elements.
[2] Figures include secondary magnesium and alloying elements incorporated in primary magnesium ingot.

Consumption of primary magnesium, including pure magnesium and magnesium content of primary alloy, totaled 18,051 tons compared with 11,947 tons in 1949.

Magnesium recovered from scrap in magnesium-alloy ingot decreased 13 percent from 1949 to 1950, but magnesium recovered by making castings from scrap increased 1,823 tons, or 268 percent. Recovery in all other products also increased, except in cathodic protection, for which 311 tons of scrap (recoverable content) were converted into anodes in 1950 compared with 555 in 1949. Secondary magnesium ingot consumed in 1950 was 5,039 tons compared with 3,809 in 1949. Magnesium-scrap consumption increased from 6,458 tons in 1949 to 8,367 in 1950. There were increases in the use of all types of magnesium material, including primary magnesium, primary magnesium alloy, secondary ingot, and scrap. An indeterminate quantity of secondary metal was contained in the primary alloy consumed. Old scrap constituted 62 percent of the total scrap used in 1950 compared with 48 percent in 1949; the increase resulted from greater consumption of old cast scrap.

The price of remelt magnesium ingot remained at 18 to 18.5 cents a pound when the price of primary metal held at 20.5 cents. The latter was increased to 21.5 cents on June 1, 1950; the remelt price immediately began to rise and was soon above the primary quotation, being quoted at 32 cents at the end of the year when the price of primary metal was 24.5 cents. This is another illustration of restraint in advancing primary prices while quotations for secondary metal were rising unchecked.

TABLE 22.—Stocks and consumption of magnesium scrap in the United States in 1950, gross weight in short tons

Scrap item	Stocks		Consumption during 1950
	Dec. 31, 1949	Dec. 31, 1950	
Cast scrap	2,113	2,335	5,795
Solid wrought scrap	737	156	1,597
Borings, grindings, drosses, etc	27	1,009	975
Total	2,877	3,500	8,367

Use of magnesium in aircraft construction rose in 1950, and this will later cause an increase in the recovery of secondary magnesium from wrecked and obsolete aircraft. It will be difficult, however, for consumers to record it as aircraft scrap, because it will have to be separated from the aluminum aircraft scrap, and most of it will have lost its identity as aircraft material by the time it reaches the smelter.

SECONDARY NICKEL

The recovery of secondary nickel from nonferrous scrap in 1950 totaled 8,795 short tons valued at $8,408,020, an increase of 55 percent in quantity over the 5,680 tons valued at $4,877,984 recovered in 1949. The total value was calculated at 47.80 cents a pound in 1950 and 42.94 cents in 1949, the average spot-delivery prices of Grade F nickel ingots and shot in 10,000-pound lots at New York.

The 1950 increase in recovery virtually equaled the 1949 decline. More secondary nickel was recovered in copper-base alloys in 1950 than in any other type of product (3,522 tons compared with 2,438 in 1949). Most of this came from nickel-silver scrap, a copper-base item, used at brass mills. There was a 2,601-ton increase in the recovery from old nickel-base scrap because more old Monel metal was used at steel plants than in 1949. This operation also increased the nickel recovered in iron and steel. Aside from the nickel obtained from scrap, the only production of nickel in the United States was a small quantity recovered as a byproduct from electrolytic copper refining. Detailed information on primary nickel may be found in the Nickel chapter of this volume.

TABLE 23.—Nickel recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable nickel content of scrap processed		
Kind of scrap	1949	1950
New scrap:		
Nickel-base	1,335	636
Copper-base	1,958	2,796
Aluminum-base	473	582
Total	3,766	4,014
Old scrap:		
Nickel-base	1,234	3,835
Copper-base	482	657
Aluminum-base	193	289
Lead-base	5	---------
Total	1,914	4,781
Grand total	5,680	8,795

Nickel recovered from scrap processed		
Form of recovery	1949	1950
As metal	46	535
In nickel-base alloys	1,062	1,336
In copper-base alloys	2,438	3,522
In aluminum-base alloys	668	874
In lead-base alloys	21	39
In cast iron and steel [1]	1,201	1,824
In chemical compounds	244	665
Grand total	5,680	8,795

[1] Includes only nonferrous nickel scrap added to cast iron and steel.

Consumption of nickel scrap totaled 27,501 tons in 1950 compared with 18,160 tons in 1949. Use of all items increased, the principal gains being 6,774 tons in nickel silver (a copper-base item), 1,456 tons in Monel metal, and 788 tons in unalloyed nickel scrap. The total does not include nickel-bearing iron and steel scrap.

Most scrap residues are generated as byproducts resulting from the use of metals in various ways and are classed as new scrap. Exceptions are some nickel catalysts which are metal residues or salts. When no longer usable as catalyzers, they are classed as old scrap because they are worn-out material. The Raney nickel catalyst is aluminum-nickel alloy, from which the aluminum has been dissolved with caustic, leaving a nickel-sponge residue. This residue may be used as a catalyst for a considerable period, sometimes several years, before it becomes so saturated or poisoned with impurities that it ceases to function. It is then sold to chemical plants, where the nickel is reclaimed as a nickel salt, which can again be used as a catalyst or in other ways.

During the first 5 months of 1950, while the price of primary nickel was 42.97 cents a pound, prices quoted by dealers at New York were 17.5 cents for nickel sheet and clippings scrap and 11.5 cents for Monel-metal clippings. The advance of the primary price to 50.97

TABLE 24.—Consumption of old and new nickel scrap in the United States in in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries		Total scrap used
	New scrap	Old scrap	New scrap	Old scrap	
Unalloyed nickel	127	99	54	918	1,198
Monel metal	297	1,608	192	2,362	4,459
Nickel silver [1]	224	4,482	16,218	136	21,060
Miscellaneous nickel alloys	38			110	148
Nickel residues	99		205	332	636
Total	785	6,189	16,669	3,858	27,501

[1] Copper-base scrap, and so tabulated except in this table and table 25.

cents on June 1 was accompanied by increases in scrap prices to 27 cents for nickel sheet and clippings and 16 cents for Monel-metal clippings. On September 21 the scrap prices rose to 47.5 and 20 cents, respectively, for the two types mentioned, whereas there was no increase in the primary price until December 13, when it was quoted at 53.80 cents a pound. On October 25 the scrap prices changed to 65 and 25 cents, respectively, where they remained until the end of the year.

TABLE 25.—Consumers' stocks of nonferrous nickel scrap [1] in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Unalloyed nickel	139	599
Nonferrous nickel alloys	2,866	2,476
Nickel residues	104	763
Total	3,109	3,838

[1] Includes nickel-silver scrap.

Imports of nickel scrap in 1948, 1949, and 1950 were 1,270 (revised) 1,429 (revised), and 625 tons, respectively. Exports in 1950 totaled 2,838 tons compared with 2,784 in 1949.

SECONDARY TIN

Recovery of secondary tin in 1950 totaled 35,481 short tons valued at $67,809,158 compared with 24,901 tons valued at $49,461,354 in 1949. Values were computed at 99.316 cents a pound in 1949 and 95.557 cents in 1950, the average New York selling price of Straits tin.

The tin-recovery table is double, as are those in the sections devoted to the other nonferrous secondary metals. It shows secondary tin recovered according to composition on the right and according to class of scrap processed on the left side. The data on the right side are compiled from individual plant outputs and those on the left by calculating the tin that could be recovered from the quantities of the different kinds of scrap reported used. The totals so derived for each side of the table do not agree because of slight errors introduced by the necessity of assuming recovery factors. As presented here, however, the items have been adjusted to give the exact balance theoretically expected. The word "recovery" thus may be applied to both sides of the table.

TABLE 26.—Secondary tin recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable tin content of scrap processed			Tin recovered from scrap processed		
Kind of scrap	1949	1950	Form of recovery	1949	1950
New scrap:			As metal:		
Tin plate	3,543	4,221	At detinning plants	3,265	3,766
Tin-base	854	1,314	At other plants	287	283
Lead-base	1,926	2,116			
Copper-base	2,055	3,647	Total	3,552	4,049
Total	8,378	11,298	In solder	7,762	9,195
			In tin babbitt	1,084	873
Old scrap:			In chemical compounds	608	701
Tin cans	111	120	In lead-base alloys	3,463	5,148
Tin-base	2,976	2,874	In brass and bronze	8,432	15,515
Lead-base	5,592	8,888			
Copper-base	7,844	12,301	Total	21,349	31,432
Total	16,523	24,183	Grand total	24,901	35,481
Grand total	24,901	35,481			

More secondary tin was recovered at detinning plants and secondary smelter plants, but the quantity recovered in 1949 from copper-base scrap almost doubled in 1950. Detinners produced 3,697 tons of pig tin from old tin cans and new tin-plate clippings and 69 tons from tin-base scrap and residues. Secondary smelters recovered an additional 283 tons of pig tin. The total of 4,049 tons of tin reclaimed as metal was 14 percent above that reclaimed in 1949. Recovery of tin in solder, chemical compounds, and lead-base alloys increased nominally; but the recovery in brass and bronze, which had dropped 34 percent in 1949, increased 84 percent in 1950. Shipments of secondary tin and lead-tin alloys are presented in the Lead section of this chapter.

Consumption of all tin-base scrap increased 15 percent in 1950. Use of block-tin pipe and pewter scrap was reduced. Consumption of scruff and dross gained 43 percent, tin-base babbitt 2 percent, and use of residues was increased almost 6 times over.

The average monthly price of primary tin fluctuated between 75.92 cents a pound in January and 77.50 cents in June, rose to 89.88 cents

TABLE 27.—Consumption of old and new tin scrap in the United States in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries		Total scrap used
	New scrap	Old scrap	New scrap	Old scrap	
Block-tin pipe, scrap, and foil		722	19	45	786
Tin scruff and dross	1,977		3	1	1,981
No. 1 pewter		117			117
High-tin babbitt		2,204	5	203	2,412
Residues	226			4	230
Total	2,203	3,043	27	253	5,526

in July, and averaged over 100 cents in the remaining months, reaching a high of 144.77 cents in December.

General Preference Order M–43, which had controlled the distribution and use of both secondary and primary tin, was revoked effective June 30. However, in September inventory control regulations were issued by the National Production Authority to limit the quantities held of most metals, except lead and antimony, to a practicable working inventory. Under provisions of NPA Order M–8, effective November 13, inventories of alloys and other materials containing tin, excluding ores and concentrates, were limited to 60 days' supply or a practicable working inventory, which ever was less. An amendment to Order M–8, effective December 18, set limits on nondefense uses of all tin—primary, secondary, tin-bearing alloys, and scrap—and prohibited use of primary tin where secondary metal could be substituted.

Exports of tin-base scrap totaled 3,137 short tons in 1950, less than one-third of the 10,332 tons exported in 1949. These exports were largely drosses and residues.

TABLE 28.—Consumers' stocks of tin-base scrap in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Unalloyed tin	35	32
Tin-base alloys	746	344
Drosses and residues	512	803
Total	1,293	1,179

Smelters' stocks of tin-base scrap decreased 9 percent in 1950. Unalloyed tin declined 9 percent and tin-base alloys 54 percent, whereas drosses and residues gained 57 percent. Dealers' buying price for scrap tin pipe averaged 62.00 cents a pound in January and 61.00 cents the next 5 months; it rose steadily thereafter to 90.00 cents in November and December, the average for the year being 70.39 cents.

Secondary tin recovered by detinning plants, as metal and in chemical compounds, increased 18 percent in 1950 compared with 1949. The total tin recovered was 4,467 short tons in 1950 against 3,798 in 1949. Tin-plate clippings and old cans were the source of 4,341 tons in 1950, of which 3,697 tons was reclaimed as metal in the form of pigs and 644 tons in the form of tin compounds. During 1949 the usage of such material provided 3,654 tons, comprising 3,195 tons of metal and 459 in compounds. The treatment of other tin-bearing materials accounts for the remaining production of 126 tons in 1950 and 144 in 1949.

The industry reported treating 469,417 long tons of tin-plate clippings in 1950. This was the largest on record and exceeded the previous peak (reached in 1949) by nearly 21 percent. The earlier peak year 1941 was exceeded by 38 percent. The average cost of such clippings delivered at plants increased from $25.21 a long ton in 1949 to $30.00 in 1950. The price of No. 1 Heavy-Melting steel scrap moved

TABLE 29.—Secondary tin recovered from scrap processed at detinning plants in the United States, 1949–50

	1949	1950
Scrap treated:		
Clean tin-plate clippings .... long tons..	387,468	469,417
Old tin-coated containers .... do....	15,382	16,818
Total .... do....	402,850	486,235
Tin recovered:		
From new tin-plate clippings .... short tons..	3,543	4,221
From old tin-coated containers .... do....	111	120
Total .... do....	3,654	4,341
Form of recovery:		
As metal .... do....	[1] 3,195	[1] 3,697
In compounds .... do....	459	644
Total .... do....	[2] 3,654	[2] 4,341
Weight of tin compounds produced .... do....	932	1,375
Average quantity of tin recovered per long ton of clean tin-plate scrap used .... pounds..	18.29	17.98
Average quantity of tin recovered per long ton of old tin-coated containers used .... pounds..	14.43	14.30
Average delivered cost of clean tin-plate scrap .... per long ton..	$25.21	$30.00
Average delivered cost of old tin-coated containers .... do....	$19.69	$20.97

[1] Includes a small tonnage of pig tin of less than standard purity and consequently subject to further refining or alloying.
[2] Recovery from tin-plate clippings and old containers only. In addition, detinners recovered 70 tons of tin as metal and 74 tons of tin in compounds from tin-base scrap and residues in 1949 and 126 tons of tin as metal and in compounds from these sources in 1950.

upward in the latter part of 1950, reaching an exceedingly high level in December. Steel scrap is one of the products of the detinning industry, being sold to open-hearth mills in hydraulically compressed billets. Old cans processed increased 9 percent to only 16,818 long tons in 1950 compared with 15,382 tons in 1949 and with the record use of 175,870 tons in 1943. Tin recovered from tin-plate clippings in 1950 was 4,221 tons, 19 percent more than 1949, while that from old cans—120 tons (mostly in the form of pig tin)—increased 8 percent.

The average quantity of tin recovered per long ton of tin-plate scrap treated was 17.98 pounds in 1950 compared with 18.29 pounds in 1949. Before the introduction of electrolytic tin plate and wartime restrictions on the weight of tin on the hot-dipped product, recoveries averaged around 37 pounds per ton of material detinned. Lower recoveries per unit for the most part continued to reflect the treatment of a larger proportion of electrolytic tin plate carrying a much thinner coating of tin than the heavier-coated, hot-dipped product. The use of electrolytic tin plate has been expanding in the manufacture of cans, closures, and crowns. The average quantity of tin recovered per long ton of old tin-coated containers used decreased slightly from 14.43 pounds in 1949 to 14.30 pounds in 1950.

Imports of tin-plate scrap were 42,394 long tons in 1950 against 41,028 in 1949 (detinned, this material would provide the equivalent of about 400 tons of tin). In 1950, 562 long tons of tin-plate scrap were exported, mostly to Japan the latter part of the year. No exports of tin-plate scrap were recorded for 1948 and 1949.

SECONDARY ZINC

Secondary zinc recovered in 1950 from purchased scrap and residues totaled 326,030 short tons, with a value of $92,592,520, representing an increase in quantity of 37 percent over the 237,813 tons valued at $58,977,624 recovered in 1949. The values have been calculated at the average weighted price for all grades of refined zinc sold by producers, which was 12.4 cents in 1949 and 14.2 in 1950. In comparison, output of primary slab zinc was 843,467 tons in 1950 and 814,782 in 1949.

TABLE 30.—Zinc recovered from scrap processed in the United States, 1949–50, in short tons

Recoverable zinc content of scrap processed		
Kind of scrap	1949	1950
New scrap:		
Zinc-base	112,177	132,827
Copper-base	73,531	118,524
Aluminum-base	454	582
Total	186,162	251,933
Old scrap:		
Zinc-base	25,002	34,185
Copper-base	26,496	39,704
Aluminum-base	153	208
Total	51,651	74,097
Grand total	237,813	326,030

Zinc recovered [1] from scrap processed		
Form of recovery	1949	1950
As metal:		
By distillation:		
Slab zinc	54,559	66,322
Zinc dust	20,895	26,961
By remelting	8,722	10,775
Total	84,176	104,058
In zinc-base alloys	11,216	16,197
In brass and bronze	104,386	161,393
In aluminum-base alloys	611	689
In chemical products:		
Zinc oxide (lead-free)	12,394	14,025
Zinc sulfate	4,418	4,677
Zinc chloride	11,366	12,600
Lithopone	8,588	11,558
Miscellaneous	658	833
Total	153,637	221,972
Grand total	237,813	326,030

[1] Zinc content.

Secondary zinc recovery from zinc-base scrap increased 22 percent from 1949 to 1950, whereas that from copper-base scrap increased 58 percent, owing chiefly to increased use of scrap at brass mills for military products. Use of copper-alloy scrap also increased at smelters and foundries, but the average zinc content of the scrap used at the mills was 26 percent compared with 10 percent at the smelters and 6 percent at the foundries. In 1950, 49 percent of the secondary zinc recovered was from copper-base scrap and 51 percent from zinc-base. In 1944, a war year, 62 percent was recovered from copper-base scrap and 38 percent from zinc-base. Secondary zinc recovered in zinc products (that is, metal, zinc-base alloys, and zinc compounds) totaled 163,948 tons in 1950, slightly over half of the total recovered, compared with 132,816 tons in 1949, which was 56 percent of the total recovery in that year.

Production of all secondary zinc products except galvanizers' stock, a minor item, increased in 1950, the greatest gains being 6,269 tons in output of chemical products (zinc content), 6,264 tons in zinc dust, and 4,381 tons in remelt die-cast slab. Of the chemicals, the greatest secondary recovery was 14,025 tons in lead-free zinc oxide. However, only about 12 percent of this pigment is made from scrap, 114,940

TABLE 31.—Production of secondary zinc and zinc-alloy products in the United States, 1946–50, gross weight in short tons

Products	1946	1947	1948	1949	1950
Redistilled slab zinc	44, 516	59, 542	[1] 62, 320	55, 041	66, 970
Zinc dust	26, 002	28, 334	29, 932	21, 243	27, 507
Remelt spelter [2]	8, 212	7, 443	7, 796	6, 045	7, 243
Remelt die-cast slab	7, 829	8, 595	10, 543	8, 266	12, 647
Zinc-die and die-casting alloys	3, 002	2, 698	3, 377	3, 873	5, 233
Galvanizing stock	876	774	580	406	354
Rolled zinc	2, 729	2, 341	2, 778	2, 775	3, 589
Secondary zinc in chemical products	45, 029	55, 525	48, 995	37, 424	43, 693

[1] Revised figure.
[2] Contains small tonnages of bars, anodes, etc.

tons of zinc having been recovered in this product from other materials than scrap in 1950.

In 1950, 10 plants made zinc dust, 9 from scrap and 1 from primary material. One plant that made zinc dust in 1949 did not operate in 1950. The 12 secondary distillers of slab zinc operating in 1949 continued in 1950. Primary plants using scrap, in addition to ore and concentrates, to make distilled slab totaled 10 in 1950 and 8 in 1949. Detailed information on primary zinc is given in the Zinc chapter of this volume.

All dross and sal skimmings generated, as well as a large proportion of ordinary zinc skimmings, are the result of galvanizing operations. Probably half of the total zinc scrap consumed in 1950 was generated in galvanizing operations. Consumption of galvanizers' dross increased 17 percent to 64,415 tons in 1950, whereas total zinc scrap consumption increased 21 percent. Dross is a high-grade, desirable scrap item, containing 90 percent or more zinc, so that most of that generated probably was consumed during the year. The consumption of 441,686 tons of slab zinc in galvanizing in 1950 compared with 350,880 tons in 1949 would indicate that generation of dross increased over 17 percent, except that, in the continuous method of galvanizing, use of which has been increasing, the generation of dross is less than in ordinary hot-dip galvanizing.

TABLE 32.—Consumption of old and new zinc scrap in the United States in 1950, gross weight in short tons

Scrap item	Remelters, smelters, and refiners		Manufacturers and foundries		Total scrap used
	New scrap	Old scrap	New scrap	Old scrap	
Clippings	3, 996		5, 102		9, 098
Sheet and strip		5, 381		308	5, 689
Engravers' plates		1, 392		331	1, 723
Skimmings and ashes	53, 893		38, 196		92, 089
Dross	64, 415				64, 415
Die castings		32, 712	1, 330	443	34, 485
Rod and die scrap		1, 530			1, 530
Flue dust	6, 091		6, 581		12, 672
Chemical residues	12, 382		8, 654		21, 036
Total	140, 777	41, 015	59, 863	1, 082	242, 737

Consumption of sal skimmings, data for which have been combined with ordinary skimmings in table 32, increased from 24,316 tons in 1949 to 28,528 in 1950. Sal skimmings result from the use of zinc ammonium chloride as a flux on the bath of molten zinc used in galvanizing; the flux prevents oxidation of the molten zinc, dissolves zinc oxide that forms, and otherwise keeps the zinc clean and bright. When the flux becomes saturated, it is skimmed off as a basic zinc oxide containing 50 to 65 percent zinc, partly in metallic form, and 5 to 15 percent chlorine, as well as carbon, iron, iron oxide, and silica. Values can be reclaimed from this residue most advantageously at chemical plants, where it may be used to make zinc chloride. Some is sold to smelters, where it is roasted to drive off the chlorine and is converted to zinc oxide pure enough to be used in the manufacture of lithopone, or to primary zinc distillation plants, where it may be mixed with ore and the zinc reduced to metallic form. Sal skimmings are, in general, an unsatisfactory type of scrap for smelting. In roasting, some of the zinc is driven off with the chlorine, and the skimmings tend to stick to the sides of the rotary kilns in which they are roasted. The chlorine gas given off pollutes the atmosphere if not absorbed by scrubbers or other means. Even in 1950, when demand for other types of zinc scrap was strong, galvanizers found it hard to dispose of this type of material.

Of the zinc scrap consumed in 1950, 83 percent was new, and in 1949, 85 percent. Most zinc scrap consists of residues, which are usually classed as new scrap. Most zinc products, except die castings, are such that very little can be salvaged for reuse. The principal use of slab zinc in 1950 was in galvanizing, and recovery from used galvanized material is as yet impractical. A little is recovered from galvanized clippings. The third-most-important use of zinc in 1950 was in brass products, from which no zinc was reported recovered in zinc form in 1950. Zinc-base alloys rank as the second-most-important use of zinc. A process has been developed for distilling zinc from brass scrap, providing an additional source of secondary unalloyed metal.[3] Used sheet and strip zinc does not return to processors of scrap in large quantity, and little zinc can be salvaged from that used for chemical purposes.

TABLE 33.—Consumers' stocks of zinc-base scrap in the United States at end of year, 1949–50, gross weight in short tons

Scrap item	Dec. 31, 1949	Dec. 31, 1950
Metallic zinc scrap	4,190	1,905
Dross	6,925	4,540
Skimmings and residues	19,101	18,024
Total	30,216	24,469

Dealers' buying prices for new zinc clippings averaged 10.38 cents a pound in 1950 compared with 7.28 in 1949 and 9.42 in 1948. The monthly average was 6.87 cents in January and February, thereafter increasing each month until November, when it was 14.75 cents. The average was unchanged in December. The prices for old zinc scrap

[3] Poland, F. F., Distillation of Zinc and Refining of Residual Metals from Copper-base Alloys: Am. Inst. Min. and Met. Eng. Tech. Pub. 2065, Metals Technol., September 1946, 15 pp.

followed about the same pattern as those for clippings. The average in January and February was 4.50 cents, after which it rose to 11.12 cents in October, at which level it remained for the balance of the year, the 12-month average being 7.77 cents compared with 5.45 in 1949 and 7.01 in 1948.

United States imports of old zinc scrap totaled 1,605 tons in 1950 compared with 1,064 in 1949. Imported drosses and residues totaled 1,229 tons in 1950 and 2,668 in 1949. Large quantities of fume from a primary plant in Canada were imported by one company for manufacturing zinc sulfate and lithopone; the zinc reclaimed from this material was not recorded as secondary zinc, but as recovered from material other than scrap. Exports of zinc scrap were 6,212 tons in 1950 compared with 1,570 in 1949.

Slag—Iron Blast Furnace

By D. G. Runner

GENERAL SUMMARY

A NEW record was established by the iron blast-furnace slag processing industry in 1950. Continued high-level activity in the construction field, combined with an increasing demand for slag as an aggregate, resulted in the largest tonnage processed in any single year by the industry during its entire history. Inasmuch as processed slag stocks are relatively small and constant from year to year, production virtually equals sales and, therefore, these terms are used interchangeably in this chapter. As indicated in table 1, sales in 1950 of all types of slag (air-cooled, granulated, and expanded) exceeded those reported for the previous year.

TABLE 1.—Iron blast-furnace slag processed in the United States, 1946–50, by types

[National Slag Association]

Year	Air-cooled						Granulated		Expanded		
	Screened			Unscreened						Value	
	Short tons	Value		Short tons	Value		Short tons	Value [1]	Short tons	Total	Average per ton
		Total	Average per ton		Total	Average per ton					
1946	14,332,896	$13,250,693	$0.92	596,957	$211,078	$0.35	1,003,789	$86,383	773,150	$1,321,685	$1.71
1947	16,712,177	17,045,020	1.02	447,908	257,683	.58	1,290,958	95,087	1,130,636	2,127,692	1.88
1948	17,656,200	19,254,900	1.09	604,100	370,000	.61	1,517,500	184,700	1,353,200	2,550,400	1.88
1949	17,769,330	21,090,445	1.19	727,595	372,727	.51	1,885,428	416,632	1,199,026	2,698,908	2.25
1950	20,047,844	24,444,231	1.22	1,005,436	639,499	.64	2,168,365	647,665	1,704,388	3,749,463	2.20

[1] Excludes value of slag used for hydraulic cement manufacture.

PRODUCTION

The output of slag from iron blast furnaces in 1950 amounted to an estimated 35,886,165 short tons compared with 30,093,957 tons reported for the preceding year.

The quantity of slag processed for commercial use in 1950, according to reports of processors to the National Slag Association, reached a new record of 24,926,033 short tons valued at $29,480,858. These totals are 15 and 20 percent, respectively, above the preceding year's figures of 21,581,379 short tons valued at $24,578,712. The output in 1950 came from 42 companies operating 63 plants for processing air-cooled slag and 12 companies operating 17 plants for expanding slag. Eight companies handle granulated slag for commercial uses.

During 1950, iron blast-furnace slag was processed in the following States: Alabama, California, Colorado, Illinois, Indiana, Kentucky, Maryland, Michigan, New York, Ohio, Pennsylvania, Texas, and West Virginia. The majority of the plants are east of the Mississippi River, with Ohio, as in 1949, being the largest processor. Alabama and Pennsylvania follow in order. These three States supplied 60 percent of the total tonnage reported during 1950. Table 2 shows the available details, by States, in 1950.

TABLE 2.—Iron blast-furnace slag processed in the United States in 1950, by States

[National Slag Association]

	Screened air-cooled			All types		
	Quantity		Value	Quantity		Value
	Short tons	Percent of total		Short tons	Percent of total	
Alabama	4,385,352	22	$4,499,213	4,969,901	20	$5,462,665
Ohio	4,915,988	24	6,592,279	6,211,631	25	7,619,969
Pennsylvania	3,205,157	16	4,664,179	3,789,138	15	4,929,560
Other States [1]	7,541,347	38	8,688,560	9,955,363	40	11,468,664
Total	20,047,844	100	24,444,231	24,926,033	100	29,480,858

[1] California, Colorado, Illinois, Indiana, Kentucky, Maryland, Michigan, New York, Texas, and West Virginia.

PREPARATION

Processed blast-furnace slag is sold in screened or unscreened air-cooled, granulated, and expanded forms. Air-cooled slag, formed when molten slag solidifies under atmospheric conditions, is processed like other crushed mineral aggregates. Granulated slag is the granular product formed when molten slag is suddenly chilled by immersion in water, whereas expanded slag is the foamed product formed when molten slag is expanded by applying a limited quantity of water. Details of these methods may be found in Bureau of Mines Bulletin 479, Iron Blast-Furnace Slag: Production, Processing, Properties, and Uses.

TRANSPORTATION

Virtually the entire output of processed slag in 1950 was moved by rail and truck, whereas only small quantities were moved by waterway. As indicated in table 3, railroads handled 47 percent and trucks 51 percent—the same pattern as in 1949.

TABLE 3.—Shipments of iron blast-furnace slag in the United States, by method of transportation, 1949–50

[National Slag Association]

Method of transportation	1949		1950	
	Short tons	Percent of total	Short tons	Percent of total
Rail	9,961,117	47	11,426,470	47
Truck	10,921,641	51	12,487,059	51
Waterway	401,785	2	499,157	2
Total shipments	21,284,543	100	24,412,686	100
Interplant handling [1]	296,836		513,347	
Total processed	21,581,379		24,926,033	

[1] This tonnage is used by the processor locally in making such products as concrete block, asphaltic concrete, etc.

CONSUMPTION

Screened air-cooled slag was the major type processed by the industry, constituting 80 percent of the total slag output during 1950. Granulated slag comprised 9 percent, expanded slag 7 percent, and unscreened air-cooled slag 4 percent.

Screened Air-Cooled Slag.—Consumption of screened air-cooled slag reached a new all-time high of 20,047,844 short tons valued at $24,444,231—2,278,514 tons above the previous record year of 1949. The use of screened air-cooled slag as aggregate in portland-cement concrete construction, bituminous construction, miscellaneous highway construction, and as railroad ballast consumed 17,908,480 short tons or 89 percent of the total for this type of slag. Other principal uses for this material were in the manufacture of concrete block, mineral wool, and as cover material and granules in roofing.

Unscreened Air-Cooled Slag.—In 1950 the quantity of unscreened air-cooled slag processed totaled 1,005,436 short tons valued at $639,499. Approximately half of this material was used in road construction.

Granulated Slag.—The consumption of granulated slag in 1950 amounted to 2,168,365 short tons—15 percent above the 1,885,428 tons reported in 1949. The chief uses for this type of material were in the manufacture of hydraulic cement and as road fill. These uses consumed 90 percent of the total processed.

232294—53——72

TABLE 4.—Air-cooled iron blast-furnace slag sold or used by processors in the United States in 1950, by uses

[National Slag Association]

Use	Screened		Unscreened	
	Short tons	Value	Short tons	Value
Aggregate in:				
Portland-cement concrete construction	2,000,609	$2,615,953		
Bituminous construction (all types)	4,435,928	5,934,819		
Highway and airport construction [1]	7,037,256	9,115,672	472,083	$305,356
Manufacture of concrete block	841,330	1,034,762		
Railroad ballast	4,434,687	3,966,842	16,749	7,871
Mineral wool	479,893	636,792		
Roofing (cover material and granules)	349,993	653,703		
Sewage trickling filter medium	48,168	80,370		
Agricultural slag, liming	38,331	53,031		
Other uses	381,649	352,287	516,604	326,272
Total	20,047,844	24,444,231	1,005,436	639,499

[1] Other than in portland-cement concrete and bituminous construction.

Expanded Slag Aggregate.—The consumption of expanded slag in 1950 increased over that for the preceding year, as 1,704,388 short tons valued at $3,749,463 were processed. These figures represent increases of 42 percent in quantity and 39 percent in value over 1949 totals. As in past years the principal use for expanded slag was in the manufacture of concrete block.

TABLE 5.—Granulated and expanded iron blast-furnace slag sold or used by processors in the United States in 1950, by uses

[National Slag Association]

Use	Granulated		Expanded	
	Short tons	Value	Short tons	Value
Road fill, etc	879,841	$409,107		
Agricultural slag, liming	44,966	48,548		
Manufacture of hydraulic cement	1,062,681	(1)		
Aggregate for concrete-block manufacture	159,877	174,210	1,601,033	$3,475,973
Aggregate in lightweight concrete			87,355	227,890
Other uses	21,000	15,800	16,000	45,600
Total	2,168,365	(1)	1,704,388	3,749,463

[1] Data not available.

PRICES

Average prices per ton for the various types of slag processed in 1950 are shown in table 6. Values for screened slag ranged from 89 cents for railroad ballast to $1.87 for slag used in the roofing industry. Unscreened air-cooled slag values ranged from 47 cents for railroad ballast to 65 cents for slag used in the construction of roads and streets. Available data on values of granulated slag show a low of 46 cents for road fill to a high of $1.09 for material used in the manufacture of concrete block, whereas average values of expanded slag were over 2 dollars per ton—$2.17 for concrete block manufacture to $2.85 for "other uses."

TABLE 6.—Average value per short ton of iron blast-furnace slag sold or used by processors in the United States in 1950, by uses

[National Slag Association]

Use	Air-cooled		Granulated	Expanded
	Screened	Unscreened		
Aggregate in:				
Portland-cement concrete construction	$1.31			[1] $2.61
Bituminous construction (all types)	1.34			
Highway and airport construction [2]	1.30	$0.65		
Manufacture of concrete block	1.23		$1.09	2.17
Railroad ballast	.89	.47		
Mineral wool	1.33			
Roofing (cover material and granules)	1.87			
Sewage trickling filter medium	1.67			
Agricultural slag, liming	1.38		1.08	
Road fill, etc			.46	
Other uses	.92	.63	.75	2.85

[1] Lightweight concrete.
[2] Other than in portland-cement concrete and bituminous construction.

IRON RECOVERY

The recovery of iron by slag processors during 1950 amounted to 296,603 short tons—an increase of 44 percent over the previous year's figure. Iron is recovered from slag either by magnetic methods or by hand picking, and the material so recovered is returned to the furnaces, thus representing a useful contribution to the iron and steel industry.

EMPLOYMENT

A total of 5,399,500 man-hours was expended by 2,015 plant and yard employees in the production of commercial slag during 1950. These figures represent a slight increase in the number of man-hours utilized and a decrease in the number of plant and yard employees compared with the previous year.

TECHNOLOGY

Considerable interest has been aroused in connection with the use of granulated slag to correct poor pavements. The granulated slag is spread over the old road and later covered with a bituminous surface. Granulated slag is also reported to be effective in correcting "rocking" concrete pavements.[1]

An unusual concrete paving project in which a special slag subgrade was used has been reported. The base was prepared run-of-crusher slag, graded from 4-inches to fines, with enough fine material present to prevent excessive mortar loss from the freshly laid concrete. The base was placed in two 4-inch loose courses each and compacted thoroughly; upon it was placed a 9-inch, reinforced concrete slab.[2]

The Silbrico Corp. of Clearing, Ill., is reported to operate the only slag brick factory in the United States. The process of manufacture, perfected by the corporation, combines 96 parts of water-granulated, steel mill slag and 4 parts of high-calcium lime.[3]

[1] Rock Products, vol. 53, No. 1, January 1950, pp. 144–145, 175–176.
[2] Contractors and Engineers Monthly, vol. 47, No. 2, February 1950, pp. 61–63.
[3] Pit and Quarry, vol. 42, No. 11, May 1950, pp. 208, 213.

Demand for construction materials has resulted in widespread use of blast-furnace slag as an aggregate in block manufacture. The Chicago Block Co., Chicago Heights, Ill., manufactures standard, special, and catch basin units utilizing slag, from a nearby steel mill, with sand and limestone. Other products include coping, sills, lintels, and architectural specialties.[4]

As a result of numerous tests made to determine reactivity, it was concluded that "high alkali content in blast-furnace slag cement does not mean that the slag cement will produce or aggravate the alkali-aggregate reaction. On the contrary, the use of slag cement in an otherwise reactive mixture usually reduces the extent of the reaction." [5]

That the slag-processing industry is growing is evidenced by the installation of new plants and improvement in existing plants. Some of these new developments were at plants of the Buffalo Slag Co., Inc., Buffalo, N. Y.,[6] the Edward C. Levy Co., Detroit, Mich.,[7] and the Sloss-Sheffield Steel and Iron Co., Birmingham, Ala.[8]

---

[4] Rock Products, vol. 53, No. 12, December 1950, pp. 184–185, 187.
[5] Cox, Herbert P., Coleman, Robert B., Jr., and White, Locke, Jr., Effect of Blast-Furnace Slag Cement on Alkali Aggregate Reaction in Concrete: Pit and Quarry, vol. 43, No. 5, November 1950, pp. 95–96.
[6] Pit and Quarry, vol. 42, No. 12, June 1950, p. 47; vol. 43, No. 6, December 1950, pp. 70–73, 77.
[7] Pit and Quarry, vol. 42, No. 11, May 1950, pp. 81–83.
[8] Rock Products, vol. 53, No. 2, February 1950, p. 84.

Slate

By Oliver Bowles and M. G. Downey

GENERAL SUMMARY

THE DOMESTIC output of slate during 1950 was substantially higher than in 1949. Sales of roofing slate gained 9 percent in quantity and value but were still below the level of output in 1948. The average value per square in 1950 was $20.75, compared with $20.71 in 1949. Gains were reported in each of the principal roofing-slate-producing centers except Vermont and Maine, where the output declined slightly.

The mill-stock branch of the industry reported much larger gains, output reaching a higher level than in any recent year. The quantity produced was 16 percent and the value 23 percent higher than in 1949. Electrical slate, structural and sanitary products, and blackboards and bulletin boards, the three principal outlets for mill stock, all showed substantial gains both in quantity and value compared with 1949. Grave vaults and covers, billiard-table tops, and school slates, the three minor categories, declined considerably below the 1949 level.

Flagstones, including slate employed for walkways, stepping stones, and miscellaneous uses, gained 55 percent in quantity and 47 percent in value.

Slate granules and flour are included as part of the slate industry. A small fraction of the output is derived from waste slate at quarries and mills, where dimension-slate products are made, but by far the largest part is obtained at independent quarries that produce granules and flour only. Most of the material so used is unsuited for other slate products. Granules are used primarily for surfacing prepared roofing, and the flour is used as a filler in paint, linoleum, and various other products. Granules and flour together increased 25 percent in quantity and 30 percent in value in 1950 compared with 1949. Figures for sales of granules of all types, including slate, are presented in the chapter on Stone of this volume.

TABLE 1.—Salient statistics of the slate industry in the United States, 1949–50

	1949			1950			Percent of change in—	
	Quantity		Value	Quantity		Value	Quantity (unit as reported)	Value
	Unit of measurement	Approximate equivalent short tons		Unit of measurement	Approximate equivalent short tons			
Domestic production (sales by producers):	*Squares*			*Squares*				
Roofing slate	181,490	68,260	$3,759,564	197,570	74,060	$4,098,842	+9	+9
Mill stock:	*Sq. ft.*			*Sq. ft.*				
Electrical slate	242,700	1,760	323,574	285,600	2,070	424,879	+18	+31
Structural and sanitary slate	806,790	6,390	627,936	1,031,180	8,200	768,602	+28	+22
Grave vaults and covers	15,460	140	12,687	2,730	20	2,507	−82	−80
Blackboards and bulletin boards	1,145,080	2,840	649,451	1,420,960	3,290	829,510	+24	+28
Billiard-table tops	164,100	1,200	100,203	161,030	1,190	95,996	−2	−4
School slates	[1] 366,910	400	13,798	[1] 279,100	370	8,936	−24	−35
Total mill stock	2,741,040	12,730	1,727,649	3,180,600	15,140	2,130,430	+16	+23
Flagstones, etc.[2]	7,945,120	51,000	912,503	12,346,248	79,440	1,342,053	+55	+47
Total slate as dimension stone		131,990	6,399,716		168,640	7,571,325	+28	+18
Granules and flour		608,270	5,764,560		761,730	7,476,156	+25	+30
Grand total domestic production		740,260	12,164,276		930,370	15,047,481	+26	+24

[1] Square feet approximate. Number of pieces: 1949, 682,270; 1950, 389,087.
[2] Includes slate used for walkways, stepping stones, and miscellaneous uses.

SALES

Dimension Slate.—Blocks or slabs cut to specified sizes and shapes are normally classed as "dimension slate"; this class includes all slate products except granules and flour. Table 2 shows sales of dimension slate for the latest 5-year period.

TABLE 2.—Dimension slate sold by producers in the United States, 1946–50

Year	Roofing			Mill stock		Other [1]		Total	
	Squares	Approximate equivalent short tons	Value	Approximate short tons	Value	Approximate short tons	Value	Approximate short tons	Value
1946	146,790	56,240	$1,982,928	12,150	$1,032,584	27,860	$403,990	96,250	$3,419,502
1947	170,590	64,350	3,094,780	13,550	1,444,835	34,610	537,705	112,510	5,077,320
1948	218,650	82,090	4,566,056	11,950	1,600,019	46,490	700,477	140,530	6,866,552
1949	181,490	68,260	3,759,564	12,730	1,727,649	51,000	912,503	131,990	6,399,716
1950	197,570	74,060	4,098,842	15,140	2,130,430	79,440	1,342,053	168,640	7,571,325

[1] Includes flagstones, walkways, stepping stones, and miscellaneous slate.

As roofing slate is used chiefly in residential building, it is interesting to compare sales of roofing slate with the trend in new units built during recent years. The relationship between these trends for the period 1925 to 1950 is shown in figure 1. Since 1944 the number of new dwelling units has increased remarkably, but roofing-slate sales have failed to even approach the dwelling-unit trend. Slate is apparently unable to compete with other types of roofing.

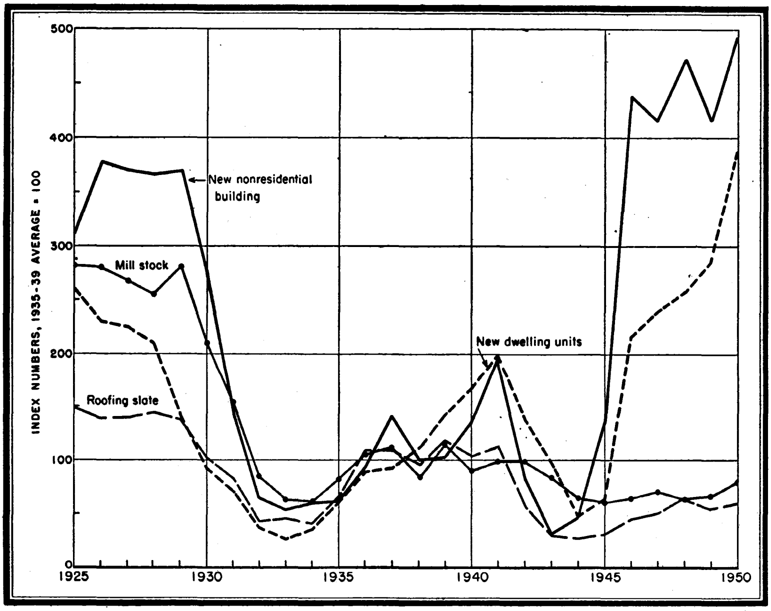

FIGURE 1.—Sales of roofing slate and mill stock compared with number of new dwelling units and value of new nonresidential construction, 1925–50. Data on number of new dwelling units (actual starts) in nonfarm areas from U. S. Department of Labor; on value of nonresidential construction activity from U. S. Department of Commerce, Survey of Current Business.

Mill-stock slate is used extensively for steps, baseboards, and other units in nonresidential types of buildings, and sales more or less paralleled construction activity in this field from 1929 to about 1939. Since that date sales of mill stock have dropped behind construction activity. Nonresidential building since 1944 has been exceptionally active, but the structures built are evidently types that use very little slate, because the increase in mill-stock output during the same period was quite moderate. These relationships are indicated in figure 1.

Figure 2 presents a graphic summary of the value of slate sold from 1915 to 1950, by uses. Two peaks were reached during this period, one in 1925 and the other in 1950. The industry declined greatly during the depression and to some extent during World War II.

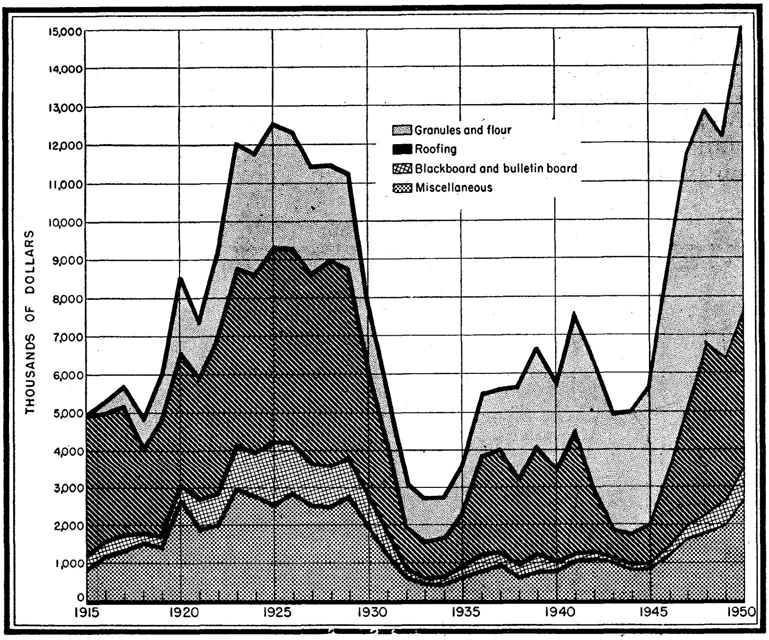

FIGURE 2.—Value of slate sold in the United States, 1915–50, by uses.

Granules and Flour.—Sales of granules increased 28 percent in quantity and 31 percent in value in 1950 compared with 1949. Both quantity and value were the highest in the history of the industry. The sales value per ton f. o. b. plant ($11.34) was also the highest on record. Sales of slate flour gained 15 percent in quantity and 16 percent in value. Granules and flour were produced in Arkansas, California, Georgia, New York, Pennsylvania, and Vermont, while Maryland and Virginia produced granules only. Sales of these products for the latest 5-year period are shown in table 3.

TABLE 3.—Crushed slate (granules and flour) sold by producers in the United States, 1946–50

Year	Granules		Flour		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	513,780	$4,851,314	149,740	$573,290	663,520	$5,424,604
1947	593,560	5,911,151	169,940	697,083	763,500	6,608,234
1948	499,440	5,306,568	159,430	707,809	658,870	6,014,377
1949	463,290	5,136,992	144,980	627,568	608,270	5,764,560
1950	595,200	6,747,325	166,530	728,831	761,730	7,476,156

REVIEW BY STATES AND DISTRICTS

As shown in table 1, total domestic production of slate increased 26 percent in quantity in 1950 compared with 1949. Ninety-four operators reported production during the year, an increase of 14. Table 4 shows sales of slate in 1950, by States and uses.

TABLE 4.—Slate sold by producers in the United States, 1946–50, by States and uses

	Operators	Roofing		Mill stock		Other uses (value)[1]	Total value
		Squares (100 square feet)	Value	Square feet	Value		
1946	61	146,790	$1,982,928	2,371,820	$1,032,584	$5,828,594	$8,844,106
1947	76	170,590	3,094,780	2,549,080	1,444,835	7,145,939	11,685,554
1948	83	218,650	4,566,056	2,541,250	1,600,019	6,714,854	12,880,929
1949	80	181,490	3,759,564	2,741,040	1,727,649	6,677,063	12,164,276
1950							
Arkansas	1					(2)	(2)
California	5					(2)	(2)
Georgia	1					(2)	(2)
Maryland	1					(2)	(2)
New York	21	800	38,874			2,015,851	2,054,725
Pennsylvania	28	124,280	2,341,127	2,724,450	1,559,587	1,645,300	5,546,014
Vermont and Maine	32	46,940	1,052,635	456,150	570,843	3,247,333	4,870,811
Virginia	5	25,550	666,206			(2)	(2)
Undistributed						1,909,725	2,575,931
Total	94	197,570	4,098,842	3,180,600	2,130,430	8,818,209	15,047,481

[1] Flagging and similar products, granules, and flour.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

Maine.—The quarries near Monson, Maine, produce electrical slate primarily, although small quantities of roofing and other products are also made. As in 1949, only one company was active during the year.

New York.—The total number of slate operators increased to 21, 5 more than in 1949, and the value of sales increased 27 percent. The principal slate products made were flagging, granules, and flour. Roofing-slate production is relatively small.

Pennsylvania.—All types of slate products are made in Lehigh and Northampton Counties, Pa., the most productive slate areas in the United States. The "soft-vein," blue-black slate characteristic of this area is suited in texture and workability for the manufacture of mill products as well as roofing and accounts for the wide range of products. Slate produced in York County in the Peach Bottom district on the Maryland-Pennsylvania border in the vicinity of Cardiff, Md., and Delta, Pa., may not be shown separately and therefore is included in Northampton County, in table 5, which gives detailed figures for Pennsylvania.

The total value of all slate products sold in Pennsylvania in 1950 increased 21 percent compared with 1949. Gains in roofing slate, electrical slate, structural and sanitary products, blackboards and bulletin boards, and slate for miscellaneous uses (principally granules and flour) were substantial both in quantity and value. The most remarkable advance was in electrical-slate products, which increased more than threefold both in quantity and value. On the other hand, sales of vaults and covers, billiard-table tops, and school slates declined considerably both in quantity and value. The percentage changes in these items in 1950 compared with 1949 were as follows: Roofing slate, increase of 10 percent in both quantity and value; electrical slate, increase of 218 percent in quantity and 209 percent in value; structural and sanitary slate, increase of 32 percent in quantity and value; vaults and covers, decrease of 85 percent in quantity and 83 percent in value; blackboards and bulletin boards, increase of 24 percent in quantity and 28 percent in value; billiard-table tops, decrease of 2 percent in quantity and 4 percent in value; and school slates, decrease of 24 percent in quantity and 35 percent in values. Slate for other uses increased 36 percent in value. Detailed statistics of production appear in table 5.

TABLE 5.—Slate sold by producers in Pennsylvania in 1950, by counties and uses

County	Operators	Roofing slate: Squares (100 square feet)	Roofing slate: Value	Mill stock: Electrical: Square feet	Electrical: Value	Structural and sanitary: Square feet	Structural and sanitary: Value	Vaults and covers: Square feet	Vaults and covers: Value
Lehigh	7	8,070	$137,981	11,050	$12,044	849,970	$611,004	--------	--------
Northampton and York [1]	21	116,210	2,203,146					2,340	$2,097
Total: 1950	27	124,280	2,341,127	11,050	12,044	849,970	611,004	2,340	2,097
1949	26	112,870	2,124,573	3,480	3,894	645,060	463,980	15,200	12,472

County	Mill stock—Continued: Blackboards and bulletin boards: Square feet	Blackboards and bulletin boards: Value	Billiard-table tops: Square feet	Billiard-table tops: Value	School slates: Square feet	School slates: Value	Other uses (value)	Total value
Lehigh	479,200	$234,763	--------	--------	279,100	$8,936	$8,500	$404,643
Northampton and York [1]	941,760	594,747	161,030	$95,996	--------	--------	1,636,800	5,141,371
Total: 1950	1,420,960	829,510	161,030	95,996	279,100	8,936	1,645,300	5,546,014
1949	1,145,080	649,451	164,100	100,203	366,910	13,798	1,210,273	4,578,644

[1] York County produced granules and flour only; included with Northampton County to avoid disclosure of individual company operations.

Vermont.—In order to avoid revealing the production figures of an individual firm, Maine has been included with Vermont in table 4, showing slate sold in the United States by States and uses. The total value of slate products sold in 1950 by Vermont and Maine was 24 percent greater than in 1949. Roofing-slate production declined 2 percent in quantity and 1 percent in value, but mill stock increased 14 percent in quantity and 18 percent in value. The value of slate for other uses increased 37 percent. There was an increase of 4 in the number of operators.

Virginia.—Roofing slate is the principal product of the Buckingham, Va., quarries. No mill stock is made. Roofing-slate sales increased 25 percent in quantity and 19 percent in value in 1950 compared with 1949. Granules were produced in substantial quantities during the year, but details cannot be given because there were too few producers.

Other Districts.—Granules and flour were produced in Montgomery County, Ark., near Glenwood; near Placerville, El Dorado County, Calif.; near Fairmount, Bartow County, Ga.; and at Whiteford, Harford County, Md. Flagging was produced in Inyo, Mariposa, and Tuolumne Counties, Calif.

PRICES

The average value of roofing slate f. o. b. quarry or mill, as reported to the Bureau of Mines, increased 4 cents per square to \$20.75 in 1950. In Pennsylvania it was \$18.84 per square, in New York \$48.59, in Vermont and Maine \$22.43, and in Virginia \$26.07.

The average value of mill stock was 67 cents per square foot, compared with 63 in 1949. The average value of electrical slate increased 16 cents (to \$1.49); structural and sanitary slate declined 3 cents (to \$0.75); vaults and covers increased 10 cents (to \$0.92); and blackboards and bulletin boards increased 1.7 cents (to \$0.584). The average sales value of granules increased 25 cents per short ton (to \$11.34), while flour increased 5 cents (to \$4.38).

Price History.—The trend in yearly average value of roofing slate and mill stock compared with wholesale prices of all building materials over a 36-year period is indicated in figure 3. From 1915 to 1920 slate prices (compared with a 1935–39 base period) were below the general average for building materials, while from 1921 to 1936 they were above. Fairly close agreement with the general average was maintained from 1936 to 1945. Since 1945 mill stock has followed closely the trend of all building materials, but roofing-slate prices have advanced considerably beyond the general average.

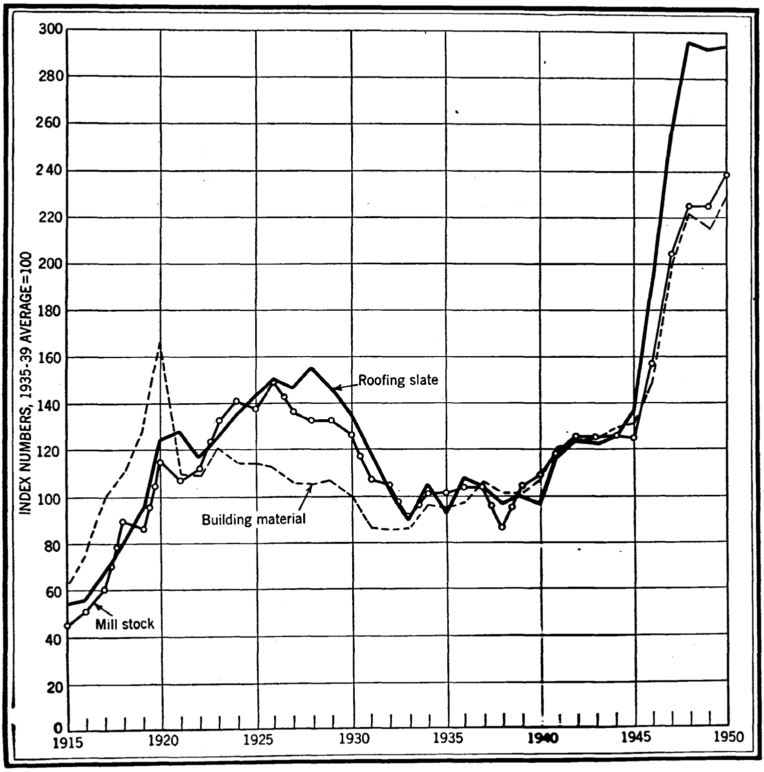

FIGURE 3.—Average value of slate compared with wholesale prices of building materials in general, 1915–50. (Wholesale prices from U. S. Department of Labor.)

FOREIGN TRADE [1]

Imports.—The value of slate imported for consumption, which has been increasing steadily during recent years, registered a remarkable gain in 1950, when it was nearly 5 times as great as in 1949. Most of the shipments were from Italy. Of the total value of imports for 1950 given in table 6, $2,351 (31,667 square feet) was for roofing, and $95,396 was classified as "other." More than three-fourths of the roofing slate originated in the United Kingdom and the remainder in Italy.

Exports.—Table 7 gives the value of exports of slate products for the latest 5-year period as reported by shippers to the Bureau of Mines. The total value of exports was 3 percent higher than in 1949.

TABLE 6.—Slate imported for consumption in the United States, 1946–50, by countries

[U. S. Department of Commerce]

Country	1946	1947	1948	1949	1950
Canada	$23	$16	$1,078	$1,125	
China		39	66	9	$123
Germany					1
Italy	83	5,688	11,584	17,589	66,548
Japan			89	51	288
Mexico	64				
Norway			10		967
Portugal	446		317	1,549	27,320
Spain			424		
Switzerland			31	406	328
United Kingdom		4	53	24	2,172
Total	616	5,747	13,652	20,753	97,747

TABLE 7.—Slate exported from the United States, 1946–50, by uses [1]

Use	1946	1947	1948	1949	1950
Roofing	$7,103	$13,748	$4,476	$9,503	$19,824
School slates [2]	21,701	30,436	25,846	16,601	8,138
Electrical	5,117	3,164	4,245	10,151	14,635
Blackboards	40,294	47,899	65,314	65,052	107,466
Billiard tables	47,605	43,161	58,692	79,687	47,000
Structural (including floors and walkways) / Slate granules and flour	386,642	466,736	428,755	414,029	417,148
Total	508,462	605,144	587,328	595,023	614,211

[1] Figures collected by the Bureau of Mines from shippers of products named.
[2] Includes slate used for pencils and educational toys.

TECHNOLOGY

The Broughton Moor Green Slate Quarries, Coniston, Lancaster, England, is using the wire saw successfully in its quarries. It is employed to cut out the masses of slate that lie between tunnels driven 60 feet apart.[2]

[1] Figures on imports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.
[2] Quarry Managers' Journal (London), The Wire Rope Saw in Slate Quarry: Vol. 34, No. 6, December 1950, pp. 336–339.

Committee C–18 on Natural Building Stone of the American Society for Testing Materials is giving further consideration to a proposed Tentative Specification for Roofing Slate. This specification has been considered satisfactory by the Federal Government and various other buyers for some years; but, as further testing has been suggested by the slate industry, the specification has been tabled for 1 year, during which time additional test data may be assembled. The committee also is continuing for another year in tentative status the Method of Testing Durability of Slate for Roofing. Additional information has been published.[3]

[3] Stone, Minutes of Annual Meeting of A. S. T. M. Committee C–18: Vol. 72, No. 4, April 1951, pp. 94–97, 99.

Stone

By Henry P. Chandler and Nan C. Jensen

GENERAL SUMMARY

SALES of crushed and dimension stone combined (252,113,050 short tons) were 13 percent greater in 1950 than the previous year and 12 percent greater than the record production of 1948. Total value ($390,582,097) increased 14 percent over that reported for 1949. Production of dimension stone in 1950 increased 15 percent, and its value 13 percent. In the crushed- and broken-stone industry, increases in both unit value and tonnage occurred in the furnace flux, the material classified as crushed stone, and the miscellaneous groups; refractory stone decreased in unit value but increased in tonnage; riprap showed a downward trend both in production and average value; and agricultural limestone decreased in tonnage but increased in average value. The total for the crushed- and broken-stone group, however, increased 13 percent by weight and 15 percent in value.

The tables in this chapter give the quantities sold or used by producers and the values f. o. b. quarries and mills. Stone quarried and used by producers is considered sold and is therefore included with sales in the statistics. The data, however, do not include stone made into abrasives, such as grindstones, or material used in making lime and cement. These are reported in terms of finished products in the Abrasive Materials, Lime, and Cement chapters. Dimension stone and crushed stone are considered separately, except in introductory tables 1 to 4, which show the total sales of stone by kinds, uses, and States.

TABLE 1.—Stone sold or used by producers in the United States, 1946–50, by kinds

Year	Granite		Basalt and related rocks (traprock)		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	11,119,490	$29,492,076	16,400,120	$20,683,202	205,260	$7,919,979	134,717,410	$155,649,197
1947	12,443,320	34,123,460	19,616,020	25,755,314	227,880	10,252,522	150,408,820	186,548,286
1948	13,685,880	38,807,266	20,654,580	29,916,965	276,000	10,421,254	166,742,390	215,451,016
1949	16,944,050	42,566,336	21,386,260	30,486,257	239,440	12,292,822	163,746,260	222,513,012
1950	22,553,180	52,220,660	22,894,830	34,372,735	267,220	10,932,234	180,918,910	252,755,827

Year	Sandstone		Other stone [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	4,253,860	$11,407,302	12,156,220	$9,187,730	178,852,360	$234,339,486
1947	6,809,080	16,586,504	18,049,670	16,078,396	207,554,790	289,344,482
1948	7,289,950	18,048,947	16,886,590	16,339,123	225,535,390	328,984,571
1949	6,954,660	19,906,326	14,755,900	13,676,892	224,026,570	341,441,645
1950	9,100,890	23,787,019	16,378,020	16,513,622	252,113,050	390,582,097

[1] Includes mica schist, conglomerate, argillite, various light-color volcanic rocks, serpentine not used as marble, soapstone sold as dimension stone, etc.

TABLE 2.—Stone sold or used by producers in the United States, 1949–50, by uses

Use	1949 Quantity	1949 Value	1950 Quantity	1950 Value
Dimension stone:				
Building stone:				
Rough construction ... short tons	126,600	$603,115	253,940	$1,133,133
Cut stone, slabs, and mill blocks [1] ... cubic feet	10,367,050	29,307,324	12,896,640	35,531,864
Approximate equivalent in short tons	789,470	...	974,750	...
Rubble ... short tons	338,980	709,176	247,210	615,241
Monumental stone ... cubic feet	3,125,300	18,757,859	2,962,830	17,824,882
Approximate equivalent in short tons	257,510	...	243,960	...
Paving blocks ... number	275,570	27,384	347,590	51,294
Approximate equivalent in short tons	1,960	...	3,740	...
Curbing ... cubic feet	738,250	1,689,043	950,040	2,429,816
Approximate equivalent in short tons	59,420	...	78,040	...
Flagging ... cubic feet	555,950	652,224	712,580	877,953
Approximate equivalent in short tons	44,490	...	57,560	...
Total dimension stone (quantities approximate, in short tons)	1,618,430	51,746,125	1,859,200	58,464,183
Crushed and broken stone:				
Riprap ... short tons	7,568,390	9,829,626	6,898,050	7,807,200
Crushed stone ... do	141,421,390	173,734,791	165,721,710	209,813,417
Furnace flux (limestone) ... do	[2]30,752,320	[2]32,267,642	35,969,820	37,932,388
Refractory stone [3] ... do	[2] 1,827,630	[2] 5,764,355	2,158,000	5,848,591
Agricultural (limestone) ... do	21,482,910	33,251,141	19,348,820	30,393,075
Other uses ... do	[2]19,355,500	[2]34,847,965	20,157,450	40,323,243
Total crushed and broken stone ... do	222,408,140	289,695,520	250,253,850	332,117,914
Grand total (quantities approximate, in short tons)	224,026,570	341,441,645	252,113,050	390,582,097

[1] To avoid disclosure of individual outputs, dimension stone for refractory use is included with building stone. Sawed building stone includes: 1949—241,610 cubic feet (17,610 tons) of stone for refractory use valued at $524,666; 1950—470,100 cubic feet (34,100 tons), $946,337.
[2] Revised figure.
[3] Ganister (sandstone), mica schist, soapstone, and dolomite.

TABLE 3.—Stone sold or used by noncommercial producers in the United States, 1949–50, by uses

[Included in total production]

Use	1949 Short tons	1949 Value	1950 Short tons	1950 Value
Building stone	11,160	$56,159	15,680	$106,049
Rubble	97,510	143,987	57,520	66,318
Riprap	3,087,220	4,085,339	2,139,220	2,033,854
Crushed stone	13,272,820	16,862,909	16,130,420	19,374,778
Agricultural (limestone)	465,590	715,519	455,540	714,171
Other uses	1,971,930	1,955,125	2,361,410	2,274,698
Total	18,906,230	23,819,038	21,159,790	24,569,868

TABLE 4.—Stone sold or used by producers in the United States, 1949–50, by States

State	1949		1950	
	Short tons	Value	Short tons	Value
Alabama	2, 636, 930	$6, 039, 867	2, 587, 500	$6, 038, 220
Arizona	356, 050	203, 295	228, 490	139, 810
Arkansas	[1] 1, 279, 250	[1] 2, 247, 236	3, 952, 720	7, 419, 110
California	11, 373, 700	12, 594, 048	11, 764, 630	13, 998, 432
Colorado	[1] 1, 816, 790	[1] 2, 803, 538	[1] 1, 679, 960	[1] 2, 776, 331
Connecticut	1, 695, 650	2, 460, 547	[1] 1, 860, 700	[1] 2, 789, 532
Delaware	37, 240	92, 100	77, 050	190, 113
Florida	4, 215, 090	4, 748, 253	5, 313, 400	6, 885, 394
Georgia	[1] 4, 156, 220	[1] 8, 427, 627	[1] 6, 144, 980	[1] 11, 917, 482
Idaho	1, 440, 680	1, 878, 801	[1] 644, 020	[1] 861, 290
Illinois	17, 054, 110	20, 682, 162	17, 911, 480	21, 970, 537
Indiana	[1] 6, 332, 360	[1] 15, 227, 818	6, 994, 670	20, 686, 160
Iowa	6, 831, 190	8, 663, 201	[1] 8, 425, 490	[1] 10, 668, 427
Kansas	[1] 5, 978, 420	[1] 7, 951, 490	7, 630, 300	8, 920, 207
Kentucky	7, 100, 160	8, 586, 402	[1] 7, 417, 200	[1] 8, 865, 913
Louisiana	(2)	(2)	(2)	(2)
Maine	258, 810	2, 025, 870	[1] 309, 740	[1] 2, 214, 164
Maryland	[1] 1, 789, 830	[1] 3, 036, 410	1, 975, 690	3, 459, 605
Massachusetts	2, 290, 940	6, 552, 935	[1] 3, 284, 470	[1] 8, 484, 999
Michigan	16, 546, 670	13, 387, 334	19, 095, 540	15, 391, 366
Minnesota	1, 878, 910	5, 278, 716	[1] 1, 953, 450	[1] 5, 334, 028
Mississippi	(2)	(2)	100, 000	115, 000
Missouri	9, 562, 720	13, 969, 008	10, 300, 400	14, 406, 627
Montana	[1] 602, 890	[1] 563, 465	919, 090	949, 545
Nebraska	[1] 504, 870	[1] 840, 758	[1] 736, 660	[1] 1, 042, 035
Nevada	518, 510	668, 960	[1] 274, 460	[1] 269, 478
New Hampshire	6, 910	381, 141	[1] 15, 760	[1] 383, 667
New Jersey	4, 070, 790	7, 896, 619	[1] 4, 672, 050	[1] 9, 119, 251
New Mexico	138, 290	106, 135	364, 930	243, 841
New York	13, 022, 070	18, 160, 387	13, 121, 850	19, 728, 957
North Carolina	6, 225, 290	10, 077, 976	7, 711, 580	11, 894, 745
North Dakota	(2)	(2)	193, 250	135, 698
Ohio	[1] 19, 364, 230	[1] 27, 419, 158	20, 466, 350	28, 628, 678
Oklahoma	4, 341, 930	4, 027, 409	5, 021, 660	4, 848, 223
Oregon	[1] 4, 397, 390	[1] 6, 479, 164	[1] 3, 836, 550	[1] 5, 559, 010
Pennsylvania	21, 226, 480	34, 855, 664	25, 493, 230	42, 205, 691
Rhode Island	[1] 74, 670	[1] 451, 029	239, 400	798, 186
South Carolina	[1] 2, 440, 540	[1] 3, 628, 596	[1] 2, 557, 510	[1] 3, 836, 056
South Dakota	[1] 1, 023, 710	[1] 4, 473, 432	[1] 1, 205, 910	[1] 4, 860, 858
Tennessee	[1] 7, 613, 530	[1] 13, 026, 948	7, 978, 590	13, 802, 288
Texas	4, 158, 430	5, 289, 647	[1] 4, 893, 150	[1] 5, 580, 463
Utah	283, 020	427, 418	929, 410	880, 667
Vermont	441, 770	8, 276, 287	447, 310	8, 038, 892
Virginia	7, 509, 740	12, 442, 765	9, 272, 740	16, 434, 602
Washington	[1] 3, 688, 890	[1] 4, 105, 516	4, 930, 820	5, 734, 563
West Virginia	4, 854, 590	6, 960, 191	[1] 5, 367, 510	[1] 7, 825, 653
Wisconsin	7, 326, 710	13, 636, 020	6, 999, 630	14, 494, 750
Wyoming	1, 802, 580	2, 227, 096	1, 841, 400	2, 214, 037
Undistributed	2, 279, 200	6, 163, 877	1, 701, 560	4, 867, 957
Total	222, 548, 750	339, 442, 316	250, 844, 240	387, 910, 538
Alaska, Hawaii, Puerto Rico	1, 477, 820	1, 999, 329	1, 268, 810	2, 671, 559
Grand total	224, 026, 570	341, 441, 645	252, 113, 050	390, 582, 097

[1] To avoid disclosing confidential information certain State totals are incomplete, the portion not included being combined with "Undistributed." The class of stone omitted from such State totals is noted in the State tables in the Statistical Summary chapter of this volume.
[2] Included with "Undistributed."

DIMENSION STONE

The term "dimension stone," as used in this chapter, is applied to blocks and slabs of natural stone, most of which are cut to definite shapes and sizes. Dimension stone is used principally for constructing masonry walls and memorials. Crushed and broken stone consists primarily of irregular fragments sized chiefly by mechanical screening and is used mainly as concrete aggregate, railroad ballast, furnace flux, and agricultural limestone.

Dimension-stone producers may be divided into three main groups on the basis of method of operation. The first group quarries stone and sells it as rough blocks or slabs; the second quarries stone and also manufactures it into finished products; and the third buys sawed slabs or rough blocks of stone and manufactures them into finished products. The Bureau of Mines statistical canvass covers the first and second groups but not the third. Bureau of Mines statistics are compiled from reports of quantities and values of original sales and include some material sold as rough blocks and some sold as finished products.

Total sales of dimension stone (including slate) in 1950 increased 16 percent in quantity and 14 percent in value compared with 1949. These over-all figures include slate, but detailed statistics of this branch of the industry appear in the Slate chapter.

TABLE 5.—Dimension stone sold or used by producers in the United States, 1949–50, by kinds and uses

Kind and use	1949	1950	
		Amount	Percent of change from 1949
Granite:			
Building stone:			
Rough construction ... short tons	55,080	77,640	+41
Value	$316,755	$437,332	+38
Average per ton	$5.75	$5.63	−2
Cut stone, slabs, and mill blocks ... cubic feet	820,650	754,180	−8
Value	$4,300,878	$4,734,777	+10
Average per cubic foot	$5.24	$6.28	+20
Rubble ... short tons	85,660	118,180	+38
Value	$204,498	$318,304	+56
Monumental stone ... cubic feet	2,772,580	2,666,710	−4
Value	$15,100,149	$14,946,508	−1
Average per cubic foot	$5.45	$5.60	+3
Paving blocks ... number	275,570	347,590	+26
Value	$27,384	$51,294	+87
Curbing ... cubic feet	578,760	900,620	+56
Value	$1,365,310	$2,278,495	+67
Total:			
Quantity ... approximate short tons	485,860	554,990	+14
Value	$21,314,974	$22,766,710	+7
Basalt and related rocks (traprock):			
Building stone:			
Rough construction ... short tons	28,100	26,730	−5
Value	$92,669	$99,466	+7
Average per ton	$3.30	$3.72	+13
Rubble ... short tons	7,270	10,610	+46
Value	$5,030	$7,532	+50
Total:			
Quantity ... short tons	35,370	37,340	+6
Value	$97,699	$106,998	+10

TABLE 5.—Dimension stone sold or used by producers in the United States, 1949–50, by kinds and uses—Continued

Kind and use	1949	1950	
		Amount	Percent of change from 1949
Marble:			
Building stone (cut stone, slabs, and mill blocks)...cubic feet..	844,740	755,070	−11
Value	$7,494,892	$6,528,013	−13
Average per cubic foot	$8.87	$8.65	−2
Monumental stone...cubic feet..	352,720	296,120	−16
Value	$3,657,710	$2,878,374	−21
Average per cubic foot	$10.37	$9.72	−6
Total:			
Quantity...approximate short tons..	101,720	89,290	−12
Value	$11,152,602	$9,406,387	−16
Limestone:			
Building stone:			
Rough construction...short tons..	24,650	117,440	+376
Value	$110,058	$422,698	+284
Average per ton	$4.46	$3.60	−19
Cut stone, slabs, and mill blocks...cubic feet..	6,327,580	8,233,220	+30
Value	$12,152,609	$17,061,008	+40
Average per cubic foot	$1.92	$2.07	+8
Rubble...short tons..	174,010	66,750	−62
Value	$307,246	$207,142	−33
Flagging...cubic feet..	180,150	197,670	+10
Value	$100,628	$113,537	+13
Total:			
Quantity...approximate short tons..	679,800	807,590	+19
Value	$12,670,541	$17,804,385	+41
Sandstone:			
Building stone:			
Rough construction...short tons..	18,770	32,130	+71
Value	$83,633	$173,637	+108
Average per ton	$4.46	$5.40	+21
Cut stone, slabs, and mill blocks...cubic feet..	1,818,760	2,433,430	+34
Value	$3,623,308	$5,037,374	+39
Average per cubic foot	$1.99	$2.07	+4
Rubble...short tons..	31,080	10,350	−67
Value	$109,024	$38,488	−65
Curbing...cubic feet..	159,490	49,420	−69
Value	$323,733	$151,321	−53
Flagging...cubic feet..	348,690	486,180	+39
Value	$520,760	$735,062	+41
Total:			
Quantity...approximate short tons..	225,590	265,500	+18
Value	$4,660,458	$6,135,882	+32
Miscellaneous stone: [1]			
Building stone...cubic feet..	555,320	720,740	+30
Value	$1,735,637	$2,170,692	+25
Average per cubic foot	$3.13	$3.01	−4
Rubble...short tons..	40,960	41,320	+1
Value	$83,378	$43,775	−47
Flagging...cubic feet..	27,110	28,730	+6
Value	$30,836	$29,354	−5
Total:			
Quantity...approximate short tons..	90,090	104,490	+16
Value	$1,849,851	$2,243,821	+21
Total dimension stone, excluding slate:			
Quantity...approximate short tons..	1,618,430	1,859,200	+15
Value	$51,746,125	$58,464,183	+13
Slate as dimension stone [2]...approximate short tons..	131,990	168,640	+28
Value	$6,399,716	$7,571,325	+18
Total dimension stone, including slate:			
Quantity...approximate short tons..	1,750,420	2,027,840	+16
Value	$58,145,841	$66,035,508	+14

[1] Includes soapstone, mica schist, volcanic rocks, argillite, and other varieties that cannot be classified in the principal groups.
[2] Details of production, by uses, are given in the Slate chapter of this volume.

BUILDING STONE

The largest use of dimension stone is for building purposes. Increased building activity in this country during 1950 resulted in the consumption of 15,993,810 cubic feet valued at $36,664,997, an increase over the 1949 figures of 35 percent and 23 percent, respectively. Table 6 gives the quantity and value of the major types of building stone sold or used in 1950.

TABLE 6.—Building stone sold or used by producers in the United States in 1950, by kinds

Kind	Rough			
	Construction		Architectural	
	Cubic feet	Value	Cubic feet	Value
Granite	935,400	$437,332	260,530	$550,436
Basalt	317,500	99,466		
Marble			309,380	1,177,991
Limestone	1,438,450	422,698	2,665,930	2,873,667
Sandstone	405,820	173,637	723,940	1,079,300
Miscellaneous				
Total	3,097,170	1,133,133	3,959,780	5,681,394

Kind	Finished				Total	
	Sawed		Cut			
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
Granite [1]	292,960	$1,528,460	200,690	$2,655,881	1,689,580	$5,172,109
Basalt					317,500	99,466
Marble	179,380	1,211,221	266,310	4,138,801	755,070	6,528,013
Limestone	3,658,600	5,702,867	1,908,690	8,484,474	9,671,670	17,483,706
Sandstone	1,595,910	3,146,669	113,580	811,405	2,839,250	5,211,011
Miscellaneous	[2] 720,740	[2] 2,170,692			720,740	2,170,692
Total	[2] 6,447,590	[2] 13,759,909	2,489,270	16,090,561	15,993,810	36,664,997

[1] Sawed stone corresponds to dressed stone for construction work (walls, foundations, bridges) and cut stone to architectural stone for high-class buildings.
[2] Rough and cut miscellaneous stone included with sawed stone.

GRANITE

Sales of granite in the form of blocks and slabs increased 14 percent in quantity and 7 percent in value over 1949. However, the average unit value decreased 6 percent. Production of rough construction stone and rubble increased, while that of rough architectural and dressed building stone decreased. Total values of all classifications of granite used as a building stone increased. Rough monumental granite increased both in volume and value over the 1949 figures, while the value of dressed monumental stone declined in both instances. Both the volume and value of sales of paving blocks and curbing increased over 1949.

Tables 8 and 9 show sales of monumental granite in the Barre district, Vermont, exclusive of small quantities of Barre granite sold as construction or crushed stone.

TABLE 7.—Granite (dimension stone) sold or used by producers in the United States in 1950, by States and uses

State	Active plants	Building								Monumental				Paving blocks		Curbing		Total	
		Rough				Dressed		Rubble		Rough		Dressed							
		Construction		Architectural															
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Cubic feet	Value	Cubic feet	Value	Number	Value	Cubic feet	Value	Short tons (approximate)	Value
California	14	(1)	(1)	570	$2,588			11,400	$28,988	34,090	$131,157	(1)	(1)			(1)	(1)	17,770	$259,447
Colorado	5					(1)	(1)	(1)	(1)	2,120	6,300	(1)	(1)					1,110	15,350
Connecticut	6	(1)	(1)	(1)	(1)	18,950	$77,240	1,870	21,552	7,080	54,671	(1)	(1)			6,680	$15,765	7,320	205,867
Georgia	14					(1)	(1)	(1)	(1)	707,800	2,183,683	(1)	(1)	(1)	(1)	(1)	(1)	127,310	3,087,249
Maine	9	2,340	$14,077	70,650	100,118	122,060	1,207,719	1,590	5,339	11,920	24,283	8,720	$115,187	180,000	$30,600	25,370	68,145	26,000	1,565,468
Maryland	4	20,000	138,000	48,580	44,000			28,000	89,500							31,100	24,450	54,530	295,950
Massachusetts	7	8,180	100,400	77,460	254,267	(1)	(1)	4,630	13,309	11,040	52,595	(1)	(1)	(1)	(1)	(1)	(1)	85,540	3,388,913
Minnesota	16	580	2,324	770	12,622	33,050	490,820			51,150	229,900	140,480	1,658,491					19,290	2,394,157
Missouri	2							400	2,778	37,950	158,004							3,570	160,782
Montana	4	210	1,437							520	1,032	100	450					260	2,919
New Hampshire	4	(1)	(1)			19,360	296,925	(1)	(1)	2,130	5,624	3,200	18,316			16,730	43,178	11,760	379,766
New York	1			50,000	113,500			3,250	14,000							3,330	6,500	7,650	134,000
North Carolina	5	2,120	7,097			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	64,260	7,524	(1)	(1)	23,880	1,163,098
Oklahoma	5			(1)	(1)			(1)	(1)	(1)	(1)	44,150	528,180			(1)	(1)	3,960	540,388
Oregon	1											(1)	(1)					(1)	(1)
Pennsylvania	7	33,260	135,119			70	650	(1)	(1)			(1)	(1)					37,560	300,122
Rhode Island	2			890	1,152			1,000	12,040	36,070	246,148							4,010	259,340
South Carolina	3	(1)	(1)							(1)	(1)	(1)	(1)			(1)	(1)	14,160	477,291
South Dakota	9			(1)	(1)	(1)	(1)			(1)	(1)	209,110	2,336,627					21,920	2,741,831
Texas	2	300	600			80	1,040					(1)	(1)					(1)	(1)
Vermont	6									921,620	3,886,971							74,650	3,886,971
Virginia	1					3,840	36,730					2,970	27,640					560	64,370
Washington	4	150	600	1,250	7,500			530	1,083	1,250	7,500					2,730	3,892	1,110	20,575
Wisconsin	9	2,000	7,000			2,570	56,540	(1)	(1)	23,970	77,105	75,820	1,243,609	(1)	(1)			10,610	1,384,591
Undistributed		8,500	30,678	10,360	14,689	293,670	2,016,677	65,510	129,715	204,210	698,807	129,240	1,254,228	103,330	13,170	814,680	2,116,565	460	38,265
Total	140	77,640	437,332	260,530	550,436	493,650	4,184,341	118,180	318,304	2,052,920	7,763,780	613,790	7,182,728	347,590	51,294	900,620	2,278,495	554,990	22,766,710
Average unit value			$5.63		$2.11		$8.48		$2.69		$3.78		$11.70		$0.15		$2.53		$41.02
Short tons (approximate)		(2)		21,470		40,800				168,330		50,450		3,740		74,380			

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] 935,400 cubic feet (approximate).

TABLE 8.—Monumental granite sold by quarrymen in the Barre district, Vermont, 1941–50

Year	Cubic feet	Value	Year	Cubic feet	Value
1941	764, 280	$2, 431, 152	1946	990, 160	$3, 461, 801
1942	612, 220	2, 035, 327	1947	937, 400	3, 534, 798
1943	635, 350	2, 267, 777	1948	1, 039, 580	3, 952, 622
1944	733, 500	2, 553, 681	1949	890, 080	3, 528, 756
1945	713, 050	2, 308, 506	1950	917, 310	3, 868, 351

TABLE 9.—Estimated output of monumental granite in the Barre district, Vermont, 1948–50

[Barre Granite Association, Inc.]

	1948	1949	1950
Total quarry output, rough stock cubic feet	1, 043, 958	894, 240	917, 685
Shipped out of Barre district in rough do	208, 792	178, 848	183, 537
Manufactured in Barre district do	835, 166	715, 392	734, 148
Light stock consumed in district do	556, 778	596, 160	489, 432
Dark stock consumed in district do	278, 388	298, 080	244, 716
Number of cutters in district	1, 748	1, 748	1, 748
Average daily wage	$12. 50	$13. 50	$13. 90
Average number of days worked	252	248	248
Total pay roll for year	$5, 506, 200	$5, 852, 304	$6, 025, 706
Estimated overhead	2, 753, 100	2, 926, 152	3, 012, 853
Estimated value of light stock	2, 421, 984	2, 950, 892	2, 938, 460
Estimated value of dark stock	1, 447, 618	1, 550, 016	1, 590, 654
Estimated polishing cost	2, 099, 965	1, 799, 658	1, 846, 840
Estimated sawing cost	1, 644, 234	1, 408, 428	1, 445, 354
Total value of granite	15, 873, 101	16, 487, 450	16, 859, 867

BASALT AND RELATED ROCKS (TRAPROCK)

Because of their dark color, basalt and related rocks are not used extensively as building stone. Sales for rough construction declined slightly from 1949 but increased in value. The volume of rubble sales increased 46 percent and its value 50 percent. Unit values of both types increased. The total increase over 1949 was 6 percent in tonnage and 10 percent in value. Basalt and related dark rocks are used to some extent for memorials but are classed in the trade as "black granite" and are therefore included with the figures for monumental granite.

TABLE 10.—Basalt and related rocks (traprock) (dimension stone) sold or used by producers in the United States in 1950, by States and uses

State	Active plants	Building stone				Total	
		Rough construction		Rubble			
		Short tons	Value	Short tons	Value	Short tons	Value
Connecticut	1	(1)	(1)			(1)	(1)
Hawaii	2	(1)	(1)	20	$32	(1)	(1)
Nevada	1			150	300	150	$300
Oregon	3	4,070	$20,364	10,440	7,200	14,510	27,564
Pennsylvania	1	21,600	77,506			21,600	77,506
Undistributed		1,060	1,596			1,080	1,628
Total	8	[2] 26,730	99,466	10,610	7,532	37,340	106,998
Average unit value			$3.72		$0.71		$2.87

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] 317,500 cubic feet (approximate).

MARBLE

Sales of all types of marble declined in 1950 compared with 1949. Total sales decreased 12 percent in cubic footage and 16 percent in value. Decreases in building stone during 1950 were 11 and 13 percent in quantity and value, respectively, while the decreases in monumental stone were 16 and 21 percent, respectively, from 1949. Unit values also declined. Tables 11 and 12 give details on marble, by uses and States.

TABLE 11.—Marble (dimension stone) sold by producers in the United States, 1949–50, by uses

Use	1949		1950	
	Cubic feet	Value	Cubic feet	Value
Building stone:				
Rough:				
Exterior	17,350	$69,023	9,140	$36,326
Interior	[1] 308,410	[1] 1,071,505	300,240	1,141,665
Finished:				
Exterior	165,110	1,506,872	96,230	939,670
Interior	353,870	4,847,492	349,460	4,410,352
Total exterior	182,460	1,575,895	105,370	975,996
Total interior	662,280	5,918,997	649,700	5,552,017
Total building stone	844,740	7,494,892	755,070	6,528,013
Monumental stone:				
Rough; Finished	352,720	3,657,710	296,120	2,878,374
Total monumental stone	352,720	3,657,710	296,120	2,878,374
Total building and monumental	1,197,460	11,152,602	1,051,190	9,406,387
Approximate short tons	101,720		89,290	

[1] Includes onyx for the manufacture of mantels, lamp bases, desk sets, clock cases, and novelties.

TABLE 12.—Marble (dimension stone) sold by producers in the United States in 1950, by States and uses

State	Active plants	Building: Cubic feet	Building: Value	Monumental: Cubic feet	Monumental: Value	Total: Quantity: Cubic feet	Total: Quantity: Short tons (approximate)	Total: Value
Alabama	2	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Arkansas	1	10,000	$15,000			10,000	850	$15,000
Colorado	1	5,570	16,710			5,570	470	16,710
Georgia	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Maryland	1	7,100	61,525			7,100	600	61,525
Minnesota	1	5,100	28,000			5,100	370	28,000
Missouri	3	58,370	622,150	2,430	$17,185	60,800	5,170	639,335
North Carolina	1	(1)	(1)			(1)	(1)	(1)
Tennessee	6	427,640	2,854,123	5,290	79,755	432,930	36,800	2,933,878
Vermont	6	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed		241,290	2,930,505	288,400	2,781,434	529,690	45,030	5,711,939
Total	23	755,070	6,528,013	296,120	2,878,374	1,051,190	89,290	9,406,387
Average unit value			$8.65		$9.72			[2] $8.95
Short tons (approximate)		64,110		25,180				

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Average value per cubic foot.

LIMESTONE

Almost all limestone blocks cut to definite shapes and sizes are used for building purposes, such as interiors and exteriors of public buildings and commercial structures. All classifications of limestone for building purposes, except rubble, increased substantially over 1949 both in quantity and value. All unit prices, except material for rough construction, advanced.

The Bedford-Bloomington, Ind., area continued to produce most of the dimension limestone in the United States, its output being 80 percent of the total rough architectural and finished (sawed and cut) limestone by volume and 74 percent by value. Tables 14 to 16 show production in the Bedford-Bloomington, Ind., and Carthage, Mo., areas over a 5-year period.

SANDSTONE

The output of sandstone in 1950 increased 18 percent in quantity and 32 percent in value over 1949. Gains in output over the previous year occurred in the case of sandstone for rough construction (71 percent), rough architectural stone (3 percent), sawed dressed building stone (60 percent), and flagging (39 percent). Losses in quantity from 1949 were noted in cut dressed building sandstone (3 percent), rubble (67 percent), and curbing (69 percent). Gains in unit prices occurred in every classification except sawed dressed building sandstone, which declined 2 percent.

Ohio continued to be the largest producing State, contributing 53 percent of the total. Other States, in order of production, were Pennsylvania, Tennessee, and New York.

Table 18 presents the sales of bluestone in 1941–50. Bluestone is a type of sandstone that splits into thin, uniform slabs. It is particularly adapted for flagging but is also used for building stone and curbing. The output declined slightly in 1950—to 1 percent less than the previous year—but the value increased 13 percent.

TABLE 13.—Limestone (dimension stone) sold or used by producers in the United States in 1950, by States and uses

State	Active plants	Building								Flagging		Total	
		Rough				Finished (cut and sawed)		Rubble					
		Construction		Architectural									
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Cubic feet	Value	Short tons (approximate)	Value
Alabama	2	(1)	(1)	(1)	(1)	(1)	(1)	----	----	----	----	(1)	(1)
California	4	(1)	(1)	----	----	----	----	(1)	(1)	----	----	2,020	$10,733
Connecticut	1	100	$345	----	----	----	----	----	----	----	----	100	345
Illinois	9	80	396	----	----	----	----	4,430	$3,736	33,710	$15,216	7,380	19,348
Indiana	18	680	1,718	2,192,140	$2,309,303	4,404,360	$10,351,555	6,220	5,373	690	300	485,200	12,668,249
Iowa	2	----	----	----	----	5,880	15,000	1,020	4,040	11,760	6,000	2,520	25,040
Kansas	17	6,070	92,650	104,100	58,955	191,290	508,717	12,430	22,691	7,210	2,062	44,220	685,075
Kentucky	5	510	743	----	----	----	----	1,070	1,107	----	----	1,580	1,850
Michigan	3	(1)	(1)	----	----	(1)	(1)	(1)	(1)	(1)	(1)	4,430	43,019
Minnesota	7	----	----	64,760	101,989	158,790	645,162	5,440	20,410	24,380	17,250	25,270	784,811
Missouri	12	8,500	20,400	----	----	32,490	239,856	11,030	97,791	6,380	5,835	22,830	363,882
New Mexico	1	----	----	----	----	----	----	270	907	----	----	270	907
New York	2	(1)	(1)	----	----	----	----	----	----	(1)	(1)	(1)	(1)
Ohio	1	5,480	12,333	----	----	----	----	440	222	----	----	5,920	12,555
Oklahoma	1	240	570	----	----	----	----	----	----	----	----	240	570
Pennsylvania	5	62,230	169,400	----	----	----	----	(1)	(1)	(1)	(1)	63,930	173,152
Puerto Rico	1	(1)	(1)	----	----	----	----	----	----	----	----	(1)	(1)
Tennessee	3	----	----	----	----	----	----	3,710	3,604	----	----	3,710	3,604
Texas	5	(1)	(1)	(1)	(1)	(1)	(1)	2,850	8,151	----	----	40,060	795,870
Vermont	1	190	150	----	----	----	----	----	----	----	----	190	150
West Virginia	1	(1)	(1)	----	----	----	----	----	----	----	----	(1)	(1)
Wisconsin	15	5,680	10,978	107,220	193,604	398,980	829,006	14,280	29,874	99,410	59,056	68,410	1,122,518
Wyoming	1	(1)	(1)	----	----	----	----	----	----	----	----	(1)	(1)
Undistributed	----	27,680	113,015	197,710	209,816	375,500	1,598,045	3,560	9,236	14,130	7,818	29,310	1,092,707
Total	117	117,440	422,698	2,665,930	2,873,667	5,567,290	14,187,341	66,750	207,142	197,670	113,537	807,590	17,804,385
Average unit value	----	----	$3.60	----	$1.08	----	$2.55	----	$3.10	----	$0.57	----	$22.05
Short tons (approximate)	----	(2)	----	195,970	----	411,260	----	----	----	16,170	----	----	----

1 Included with "Undistributed" to avoid disclosure of individual company operations.
2 1,438,450 cubic feet (approximate).

TABLE 14.—Limestone sold by producers in the Indiana oolitic limestone district, 1946–50, by classes

Year	Construction					
	Rough block		Sawed and semifinished		Cut	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1946	1,930,710	$1,143,664	1,340,930	$1,411,831	453,010	$1,460,305
1947	2,082,330	1,492,620	1,398,440	1,563,008	470,620	1,834,447
1948	2,328,180	1,914,559	1,974,730	2,312,829	682,480	3,205,984
1949	1,896,780	1,742,517	2,215,940	2,805,866	803,140	3,377,699
1950	2,192,140	2,309,303	3,213,160	4,669,493	1,191,200	5,682,062

Year	Construction—Continued			Other uses		Total	
	Total						
	Cubic feet	Short tons (approximate)	Value	Short tons	Value	Short tons (approximate)	Value
1946	3,724,650	270,040	$4,015,800	77,550	$45,144	347,590	$4,060,944
1947	3,951,390	286,480	4,890,075	90,440	306,784	376,920	5,196,859
1948	4,985,390	361,440	7,433,372	165,400	328,656	526,840	7,762,028
1949	4,915,860	356,400	7,926,082	48,320	149,753	404,720	8,075,835
1950	6,596,500	478,250	12,660,858	276,620	441,797	754,870	13,102,655

TABLE 15.—Purchased Indiana limestone sold by mills in the Indiana oolitic limestone district, 1946–50, by classes

Year	Sawed and semifinished		Cut		Total	
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value
1946	42,360	$44,200	590,320	$1,972,265	632,680	$2,016,465
1947	68,020	72,594	994,510	3,583,166	1,062,530	3,655,760
1948	357,080	491,898	845,850	3,558,754	1,202,930	4,050,652
1949	117,270	166,809	1,016,050	5,365,837	1,133,320	5,532,646
1950	141,510	198,859	921,900	4,674,820	1,063,410	4,873,679

TABLE 16.—Limestone and marble sold by producers in the Carthage district, Jasper County, Mo., 1946–50, by classes

Year	Dimension stone (rough and dressed)							Other uses		Total	
	Building		Monumental		Total						
	Cubic feet	Value	Cubic feet	Value	Cubic feet	Short tons (approximate)	Value	Short tons	Value	Short tons (approximate)	Value
1946	49,190	$289,866	10,610	$41,718	59,800	5,080	$331,584	265,260	$550,998	270,340	$882,582
1947	58,220	487,799	2,980	24,357	61,200	5,200	512,156	300,680	513,273	305,880	1,025,429
1948	64,510	532,905	5,380	29,636	69,890	5,940	562,541	230,540	396,006	236,480	958,547
1949	84,810	934,036	4,530	26,772	89,340	7,590	960,808	238,250	420,833	245,840	1,381,641
1950	75,630	805,532	2,430	17,185	78,060	6,640	822,717	252,960	467,926	259,600	1,290,643

TABLE 17.—Sandstone (dimension stone) sold or used by producers in the United States in 1950, by States and uses

State	Active plants	Building								Rubble		Curbing		Flagging		Total	
		Rough construction		Rough architectural		Dressed											
						Sawed		Cut									
		Short tons	Value	Cubic feet	Value	Cubic feet	Value	Cubic feet	Value	Short tons	Value	Cubic feet	Value	Cubic feet	Value	Short tons (approximate)	Value
California	2	3,070	$21,643													3,070	$21,643
Colorado	3	1,610	20,878	54,000	$84,800					430	$1,123			21,150	$18,150	7,900	124,951
Indiana	1			1,150	1,220	13,960	$28,266							1,720	2,612	1,310	32,098
Kansas	1	330	422							140	57					470	479
Massachusetts	1			(1)	(1)	(1)	(1)	(1)	(1)							(1)	(1)
Michigan	1	50	385	140	257					510	2,073			1,360	1,097	680	3,812
Missouri	2			1,250	1,250	7,500	18,000			360	1,065					1,060	20,315
Montana	1									270	117					270	117
New Jersey	1			5,030	3,618					80	254					480	3,872
New Mexico	1									50	30					50	30
New York (bluestone)	8	(1)	(1)	5,450	8,903	(1)	(1)	(1)	(1)	(1)	(1)	5,490	$7,908	205,470	283,543	20,780	456,605
Ohio	8			165,330	261,557	1,531,260	2,902,394	80,360	$471,824			40,620	140,713	127,570	236,130	141,020	4,012,618
Pennsylvania [2]	16	22,950	98,961	23,270	10,511					6,520	28,174	3,310	2,700	86,250	134,895	38,670	275,241
Tennessee	2			(1)	(1)	(1)	(1)							(1)	(1)	37,420	780,758
Utah	1									1,000	1,000					1,000	1,000
Virginia	3	(1)	(1)							(1)	(1)			(1)	(1)	(1)	(1)
Washington	1			45,510	114,960			14,060	160,335							4,770	275,295
Wisconsin	3	60	120	4,110	5,843			(1)	(1)					(1)	(1)	510	13,698
Wyoming	1									50	150					50	150
Undistributed		4,060	31,228	418,700	586,381	43,190	198,009	19,160	179,246	940	4,445			42,660	58,635	5,990	113,200
Total	57	32,130	173,637	723,940	1,079,300	1,595,910	3,146,669	113,580	811,405	10,350	38,488	49,420	151,321	486,180	735,062	265,500	6,135,882
Average unit value			$5.40		$1.49		$1.97		$7.14		$3.72		$3.06		$1.51		$23.11
Short tons (approximate)		(3)		55,730		116,140		8,530				3,660		38,960			

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Includes 144,560 cubic feet of bluestone (approximately 12,200 tons) valued at $147,532 sold for rough building, curbing, and flagging.
[3] 405,820 cubic feet (approximate).

TABLE 18.—Bluestone (dimension stone) sold or used in the United States, 1941–50 [1]

Year	Cubic feet	Value	Year	Cubic feet	Value
1941	284,190	$252,313	1946	273,720	$274,517
1942	183,470	166,787	1947	274,680	326,168
1943	99,840	92,059	1948	325,940	462,716
1944	156,160	108,732	1949	395,500	533,727
1945	109,330	89,448	1950	390,460	604,137

[1] New York and Pennsylvania were the only producing States.

MISCELLANEOUS STONE

Types of stone other than those included in the major groups already discussed are covered in table 19. The principal types in this classification are mica schist, argillite, light-colored volcanic rocks (such as rhyolite), soapstone, and greenstone. The quantity sold in 1950 increased 16 percent and the value 21 percent over 1949.

TABLE 19.—Miscellaneous varieties of stone (dimension stone) sold or used by producers in the United States in 1950, by States and uses

State	Active plants	Building				Flagging		Total	
		Rough and dressed		Rubble					
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
California	6	1,880	$28,019	2,680	$5,588	370	$8,000	4,930	$41,607
Colorado	1			(1)	(1)			(1)	(1)
Georgia	1	250	1,000					250	1,000
Maryland	4	8,360	57,252	(1)	(1)	(1)	(1)	8,620	60,033
New York	2	(1)	(1)					(1)	(1)
Pennsylvania	2	(1)	(1)			(1)	(1)	41,870	158,048
Virginia	2	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Washington	1	600	2,125					600	2,125
Wisconsin	1	(1)	(1)			(1)	(1)	(1)	(1)
Wyoming	1			37,670	36,219			37,670	36,219
Undistributed		49,650	2,082,296	970	1,968	2,060	21,354	10,550	1,944,789
Total	21	[2] 60,740	2,170,692	41,320	43,775	[3] 2,430	29,354	104,490	2,243,821
Average unit value			$35.74		$1.06		$12.08		$21.47

[1] Included with "Undistributed" to avoid disclosure of individual company operations.
[2] Approximately 720,740 cubic feet.
[3] Approximately 28,730 cubic feet.

TRENDS IN USE OF DIMENSION STONE

A 35-year history of the output of dimension stone by kinds is indicated in figure 1. The depression years of the 1930's and later the war years had a detrimental effect on the industry, but since 1944 there has been an upward trend.

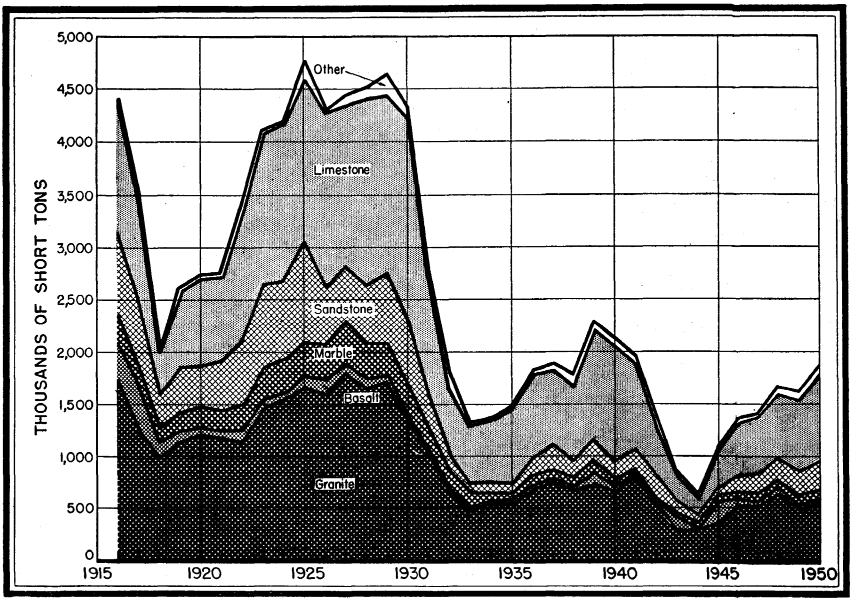

FIGURE 1.—Sales of dimension stone in the United States, by kinds, 1916–50.

Figure 2 traces, for a 36-year period, the history of production of building stones as a whole and of the chief variety, limestone, in their relation to nonresidential building, the class of construction using stone most extensively. Activity in building-stone production in peacetime generally follows the trend of nonresidential construction, and the industry is currently following this general trend.

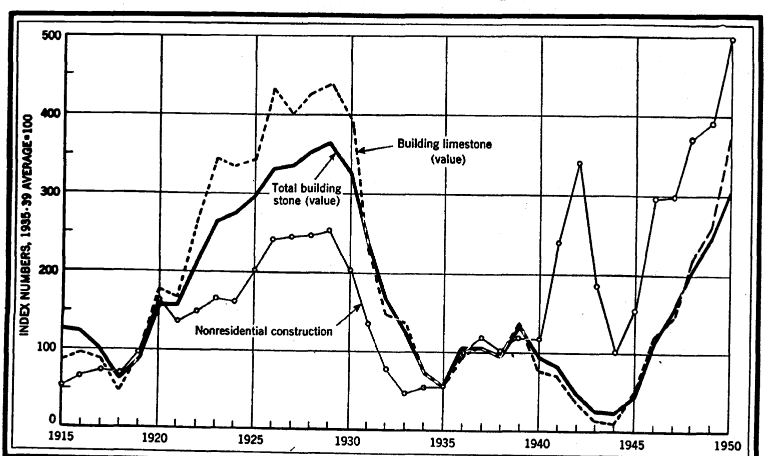

FIGURE 2.—Sales of all building stone and building limestone compared with nonresidential construction (public and private), 1915–50. Data on nonresidential-building construction from Survey of Current Business.

TECHNOLOGY

Recent trends in the preservation of natural stone masonry have been described,[1] and the methods of preservation in use over 150 years ago were cited to show the advantages of such treatment.[2]

A description of a large sandstone quarry, methods of working the deposit, and preparation of the stone for market has been published.[3]

The production of Italian marble and contemplated output for the next 3 years was the subject of a recent technical review.[4]

A special report on an occurrence of limestone in California has been published.[5]

Colorado "travertine" was discussed before the Colorado Mining Association.[6]

The commercial granites of Virginia have recently been described.[7]

California "black granite" was the subject of a recent report.[8]

A recent trade-journal article expressed the alarm felt in certain quarters at the possibility of increased importation of foreign stone into America.[9]

CRUSHED AND BROKEN STONE

Over 250 million tons of crushed and broken stone, in addition to that used for making cement and lime, were produced in the United States during 1950. This output constitutes a record for material of that type, and represents a 13-percent increase in quantity and 15-percent in value over the previous year.

Tonnage gained in all classifications except riprap and agricultural stone, where slight losses were noted. The average value was $1.33 a ton, a 3-cent gain over 1949.

Table 20 shows the quantity sold and the value of the output during 1949 and 1950, by uses. Detailed data on asphaltic stone and slate granules and flour are given in the Asphalt and Slate chapters of this volume.

Tables 21 and 22 show the tonnage and value of stone used for concrete and road metal and for railroad ballast for a series of years and by States for 1950.

---

1 Stone Trades Journal (London), vol. 69, No. 11, Nov. 11, 1950, p. 116.
2 Stone Trades Journal (London), vol. 69, No. 12, December 1950, p. 129.
3 Rocks and Minerals, vol. 25, No. 7-8, July-August 1950, pp. 370-371.
4 Mine and Quarry Engineering (London), vol. 16, No. 8, August 1950, p. 267.
5 Walker, George W., Sierra Blanca Limestone: Spec. Rept. 1-A, California Div. of Mines, December 1950, pp. 1-5.
6 Smith, George E., Colorado Travertine: Proc. Ann. Meeting, Colorado Min. Assoc., Denver, Colo., Feb. 4, 1950 (mimeographed).
7 Steidtmann, Edward, Commercial Granites and Other Crystalline Rocks of Virginia: Jour. Geol., vol. 58, No. 2, March 1950, p. 178.
8 Hoppin, Richard A., and Norman, L. A., Jr., Commercial "Black Granite" of San Diego County, Calif.: Spec. Rept. 3, California Div. of Mines, December 1950, pp. 1-19.
9 Stone Trades Journal (London), vol. 69, No. 11, November 1950, p. 122.

TABLE 20.—Crushed and broken stone sold or used by producers in the United States, 1949–50, by principal uses

Use	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Concrete and road metal	124, 367, 210	$158, 357, 911	$1. 27	147, 107, 670	$192, 293, 884	$1. 31
Railroad ballast	17, 054, 180	15, 376, 880	. 90	18, 614, 040	17, 519, 533	. 94
Metallurgical	[1] 30, 752, 320	[1] 32, 267, 642	1. 05	35, 969, 820	37, 932, 388	1. 05
Alkali works	6, 022, 240	5, 641, 705	. 94	6, 174, 350	5, 869, 819	. 95
Riprap	7, 568, 390	9, 829, 626	1. 30	6, 898, 050	7, 807, 200	1. 13
Agricultural	21, 482, 910	33, 251, 141	1. 55	19, 348, 820	30, 393, 075	1. 57
Refractory (ganister, mica schist, dolomite, soapstone)	[1] 1, 827, 630	[1] 5, 764, 355	[1] 3. 15	2, 158, 000	5, 848, 591	2. 71
Asphalt filler	671, 560	1, 893, 964	2. 82	750, 050	2, 777, 973	3. 70
Calcium carbide works	652, 950	654, 470	1. 00	749, 930	782, 993	1. 04
Sugar factories	555, 030	1, 361, 169	2. 45	717, 620	1, 608, 097	2. 24
Glass factories	621, 840	1, 373, 314	2. 21	769, 680	1, 720, 504	2. 24
Paper mills	417, 850	766, 856	1. 84	431, 940	942, 439	2. 18
Other uses	[1] 10, 414, 030	[1] 23, 156, 487	[1] 2. 22	10, 563, 880	26, 621, 418	2. 52
Total	222, 408, 140	289, 695, 520	1. 30	250, 253, 850	332, 117, 914	1. 33
Portland and natural cement and cement rock [2]	55, 219, 000	(3)		59, 361, 000	(3)	
Lime [4]	12, 637, 000	(3)		14, 980, 000	(3)	
Grand total	290, 264, 000	(3)		324, 595, 000	(3)	
Asphaltic stone	1, 150, 931	4, 264, 989	3. 71	1, 184, 676	3, 522, 308	2. 97
Slate granules and flour	608, 270	5, 764, 560	9. 48	761, 730	7, 476, 156	9. 81

[1] Revised figure.
[2] Value reported as cement in chapter on Cement.
[3] No value available for stone used in manufacture of cement and lime.
[4] Value reported as lime in chapter on Lime.

TABLE 21.—Crushed stone for concrete and road metal and railroad ballast sold or used by producers in the United States, 1946–50

Year	Concrete and road metal		Railroad ballast		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1946	90, 358, 900	$97, 765, 446	16, 908, 350	$13, 127, 058	107, 267, 250	$110, 892, 504
1947	107, 077, 590	125, 753, 455	16, 350, 260	13, 566, 869	123, 427, 850	139, 320, 324
1948	121, 542, 170	149, 879, 694	18, 180, 990	16, 315, 834	139, 723, 160	166, 195, 528
1949	124, 367, 210	158, 357, 911	17, 054, 180	15, 376, 880	141, 421, 390	173, 734, 791
1950	147, 107, 670	192, 293, 884	18, 614, 040	17, 519, 533	165, 721, 710	209, 813, 417

TABLE 22.—Crushed stone for concrete and road metal and railroad ballast sold or used by producers in the United States in 1950, by States

State	Concrete and road metal		Railroad ballast		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	259,740	$510,665			259,740	$510,665
Arizona	215,150	118,431			215,150	118,431
Arkansas	3,086,140	6,542,925	[1] 380	[1] $342	[1] 3,086,520	[1] 6,543,267
California	[1] 7,373,320	[1] 8,177,232	[1] 277,340	[1] 120,028	8,880,550	9,360,655
Colorado	[1] 398,090	[1] 505,438	(2)	(2)	680,890	967,390
Connecticut	1,658,700	2,182,238	75,470	83,012	1,734,170	2,265,250
Delaware	72,050	180,113			72,050	180,113
Florida	4,484,490	5,917,467	(2)	(2)	[1] 4,484,490	[1] 5,917,467
Georgia	5,042,320	6,604,621	[1] 265,720	[1] 290,603	[1] 5,308,040	[1] 6,895,224
Idaho	[1] 460,080	[1] 697,101	(2)	(2)	971,700	1,244,924
Illinois	10,349,860	11,739,522	1,088,920	1,164,596	11,438,780	12,904,118
Indiana	[1] 4,017,050	[1] 4,587,694	557,550	622,098	[1] 4,574,600	[1] 5,209,792
Iowa	[1] 6,457,030	[1] 7,539,927	4,220	4,640	[1] 6,461,250	[1] 7,544,567
Kansas	4,102,290	5,233,341	1,508,500	683,167	5,610,790	5,916,508
Kentucky	[1] 6,304,690	[1] 7,683,940	372,600	321,557	[1] 6,677,290	[1] 8,005,497
Maine	[1] 194,310	[1] 322,410			[1] 194,310	[1] 322,410
Maryland	1,661,560	2,445,384	197,690	295,927	1,859,250	2,741,311
Massachusetts	2,444,770	3,356,542	226,000	267,361	2,670,770	3,623,903
Michigan	2,762,890	2,419,694	(2)	(2)	[1] 2,762,890	[1] 2,419,694
Minnesota	1,258,030	1,357,301	339,030	279,732	1,597,060	1,637,033
Missouri	5,545,040	7,106,063	871,790	269,847	6,416,830	7,375,910
Montana	45,620	50,989	[1] 587,810	[1] 554,446	[1] 633,430	[1] 605,435
Nebraska	183,970	270,365			183,970	270,365
Nevada	[1] 274,310	[1] 269,178			[1] 274,310	[1] 269,178
New Hampshire	[1] 1,630	[1] 2,242			[1] 1,630	[1] 2,242
New Jersey	[1] 3,978,430	[1] 7,044,897	273,130	468,571	[1] 4,251,560	[1] 7,513,468
New Mexico	[1] 42,940	[1] 20,910	(2)	(2)	[1] 42,940	[1] 20,910
New York	[1] 9,928,870	[1] 14,230,130	[1] 896,730	[1] 992,662	[1] 10,825,600	[1] 15,222,792
North Carolina	[1] 7,043,430	[1] 9,650,597	[1] 9,850	[1] 10,835	7,634,220	10,277,717
North Dakota	(2)	(2)	(2)	(2)	130,750	130,698
Ohio	8,823,600	10,114,577	1,244,160	1,363,392	10,067,760	11,477,969
Oklahoma	2,077,890	2,228,970	[1] 1,427,610	[1] 665,417	[1] 3,505,500	[1] 2,894,387
Oregon	3,117,800	4,867,672	427,760	408,163	3,545,560	5,275,835
Pennsylvania	11,911,980	17,920,554	[1] 992,150	[1] 1,489,270	[1] 12,904,130	[1] 19,409,824
Rhode Island	206,690	417,333			206,690	417,333
South Carolina	[1] 1,976,370	[1] 2,685,801	355,630	463,341	[1] 2,332,000	[1] 3,149,142
South Dakota	1,074,650	1,915,355	(2)	(2)	[1] 1,074,650	[1] 1,915,355
Tennessee	5,832,400	7,173,106	643,280	623,923	6,475,680	7,797,029
Texas	[1] 3,034,190	[1] 2,910,661	[1] 376,790	[1] 295,758	[1] 3,410,980	[1] 3,206,419
Utah	[1] 126,910	[1] 45,690	42,480	68,371	[1] 169,390	[1] 114,061
Vermont	[1] 60,700	[1] 71,511	(2)	(2)	[1] 60,700	[1] 71,511
Virginia	[1] 6,176,120	[1] 9,333,798	718,640	763,415	[1] 6,894,760	[1] 10,097,213
Washington	[1] 3,332,760	[1] 3,344,639	360,050	307,438	[1] 3,692,810	[1] 3,652,077
West Virginia	1,500,850	2,845,113	385,690	415,629	1,886,540	3,260,742
Wisconsin	[1] 4,415,990	[1] 4,588,500	[1] 201,670	[1] 212,786	4,625,430	4,814,621
Wyoming	140,050	129,543	[1] 429,150	[1] 412,958	[1] 569,200	[1] 542,501
Undistributed	2,528,130	2,506,694	3,451,080	3,593,398	3,235,440	3,266,604
Total	145,983,880	189,866,874	18,608,870	17,512,683	164,592,750	207,379,557
Alaska, Hawaii, Puerto Rico	1,123,790	2,427,010	5,170	6,850	1,128,960	2,433,860
Grand Total	147,107,670	192,293,884	18,614,040	17,519,533	165,721,710	209,813,417

[1] To avoid disclosing confidential information, total is somewhat incomplete, the portion not included being combined as "Undistributed."
[2] Included with "Undistributed."

COMMERCIAL AND NONCOMMERCIAL OPERATIONS

In contrast with strictly commercial operations, noncommercial operations represent tonnages reported by States, counties, municipalities, and other Government agencies as being produced by themselves or by contractors for their own consumption. Table 23 shows the production of crushed stone for concrete and road metal during recent years by both types of operations. Noncommercial operations during 1950 gained 22 percent over 1949 compared with an 18-percent gain for commercial ones, reversing the trend of the previous year.

TABLE 23.—Crushed stone for concrete and road metal sold or used by commercial and noncommercial operators in the United States, 1946–50

[Figures for "noncommercial operations" represent tonnages reported by States, counties, municipalities, and other Government agencies, produced either by themselves or by contractors expressly for their consumption, often with publicly owned equipment; they do not include purchases from commercial producers. Figures for "commercial operations" represent tonnages reported by all other producers.]

Year	Commercial operations				Noncommercial operations				Total	
	Short tons	Average value per ton	Percent of change in quantity from preceding year	Percent of total quantity	Short tons	Average value per ton	Percent of change in quantity from preceding year	Percent of total quantity	Short tons	Percent of change in quantity from preceding year
1946	83,879,680	$1.07	+41	93	6,479,220	$1.23	+36	7	90,358,900	+41
1947	95,178,440	1.19	+13	89	11,899,150	1.09	+84	11	107,077,590	+19
1948	108,029,360	1.23	+14	89	13,512,810	1.25	+14	11	121,542,170	+14
1949	111,094,390	1.27	+3	89	13,272,820	1.27	−2	11	124,367,210	+2
1950	130,977,250	1.32	+18	89	16,130,420	1.20	+22	11	147,107,670	+18

GRANULES

The output of granules for roofing purposes has been canvassed since 1942. Table 24 shows total production and value for the past 5 years. Separate figures for slate granules are given in the Slate chapter of this volume.

TABLE 24.—Roofing granules [1] sold or used in the United States, 1946–50, by kinds

Year	Natural		Artificially colored		Brick		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	447,910	$3,470,411	877,990	$12,939,512	54,660	$866,174	1,380,560	$17,276,097
1947	504,980	4,166,810	1,133,870	17,559,227	56,570	998,434	1,695,420	22,724,471
1948	448,150	3,828,307	1,002,430	16,563,351	35,110	586,173	1,485,690	20,977,831
1949	352,846	3,088,402	977,934	16,489,253	23,425	400,919	1,354,205	19,978,574
1950	489,794	4,312,531	1,294,275	22,276,565	13,660	263,752	1,797,729	26,852,848

[1] Manufactured from stone, slate, slag, and brick.

SIZE OF PLANTS

In 1950 the number of crushed-stone plants was 1,622, 40 less than in 1949, while the average production increased 16 percent, or approximately 141,000 tons. During the year, 520 plants produced less than 25,000 tons each but supplied slightly over 2 percent of the total output. On the other hand, the 32 plants that produced over 900,000 tons each contributed 25 percent of the total. Table 25 shows additional details of the size pattern of the industry.

TABLE 25.—Number and production of commercial crushed-stone[1] plants in 1949–50, by size of output

Size of output	1949 Number of plants	1949 Total production of plants (short tons)	1949 Percent of total	1949 Cumulative total (short tons)	1950 Number of plants	1950 Total production of plants (short tons)	1950 Percent of total	1950 Cumulative total (short tons)
Less than 1,000 tons	60	21, 250	0. 01	21, 250	49	22, 950	0. 01	22, 950
1,000 to 25,000	519	5, 542, 200	2. 72	5, 563, 450	471	5, 044, 040	2. 20	5, 066, 990
25,000 to 50,000	259	9, 291, 880	4. 57	14, 855, 330	251	9, 190, 720	4. 01	14, 257, 710
50,000 to 75,000	224	13, 742, 110	6. 75	28, 597, 440	185	11, 387, 660	4. 97	25, 645, 370
75,000 to 100,000	107	9, 095, 350	4. 47	37, 692, 790	140	12, 058, 880	5. 27	37, 704, 250
100,000 to 200,000	231	32, 079, 020	15. 77	69, 771, 810	236	33, 563, 530	14. 66	71, 267, 780
200,000 to 300,000	112	27, 188, 560	13. 36	96, 960, 370	103	25, 020, 380	10. 93	96, 288, 160
300,000 to 400,000	49	16, 611, 580	8. 17	113, 571, 950	72	24, 903, 960	10. 88	121, 192, 120
400,000 to 500,000	29	13, 151, 480	6. 46	126, 723, 430	31	13, 852, 520	6. 05	135, 044, 640
500,000 to 600,000	17	9, 413, 340	4. 63	136, 136, 770	15	8, 346, 320	3. 64	143, 390, 960
600,000 to 700,000	12	7, 746, 050	3. 81	143, 882, 820	15	9, 593, 000	4. 19	152, 983, 960
700,000 to 800,000	10	7, 545, 410	3. 71	151, 428, 230	12	9, 042, 710	3. 95	162, 026, 670
800,000 to 900,000	7	6, 540, 890	3. 21	157, 969, 120	10	8, 753, 870	3. 82	170, 780, 540
900,000 tons and over	26	45, 503, 740	22. 36	203, 472, 860	32	58, 208, 790	25. 42	228, 989, 330
Total	1, 662	203, 472, 860	100. 00	203, 472, 860	1, 622	228, 989, 330	100. 00	228, 989, 330

[1] Exclusive of marble, which is primarily a dimension-stone industry.

METHODS OF TRANSPORTATION

Little change was noted from the previous year in the transportation methods used by the crushed-stone industry in 1950. Over half of the tonnage continued to be moved by truck. Waterways provide relatively minor but locally important transportation facilities. In previous years the table included only transportation statistics on the commercial stone used for concrete and road metal. However, since 1946 the table has included all commercial crushed stone.

TABLE 26.—Crushed stone sold or used in the United States in 1950, by methods of transportation

Method of transportation	Commercial operations		Commercial and noncommercial[1] operations	
	Short tons	Percent of total	Short tons	Percent of total
Truck	114, 328, 140	50	135, 414, 730	54
Rail	78, 585, 650	34	78, 585, 650	31
Waterway	25, 013, 170	11	25, 013, 170	10
Unspecified	11, 240, 300	5	11, 240, 300	5
	229, 167, 260	100	250, 253, 850	100

[1] Entire output of noncommercial operations assumed to be moved by truck.

GRANITE

Both the quantity and the value of crushed-granite production gained sharply in 1950 over 1949, the increase being 34 percent in tonnage and 39 percent in value. The average unit price also advanced 5 cents a ton to $1.34. Material for concrete and road metal showed the largest individual gain. A loss in tonnage occurred in the crushed granite assigned to "other uses"; however, the value of this material advanced slightly. Gains in the average unit values were noted in riprap and the "other uses." Georgia was the principal producer in 1950, followed by North Carolina, Virginia, South Carolina, and California, in that order.

TABLE 27.—Granite (crushed and broken stone) sold or used by producers in the United States in 1950, by States and uses

State	Riprap		Crushed stone				Other uses [1]		Total	
			Concrete and road metal		Railroad ballast					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Arizona			380	$300					380	$300
California	206,910	$118,602	(2)	(2)	(2)	(2)	(2)	(2)	1,816,290	1,431,275
Colorado	(2)	(2)	(2)	(2)	(2)	(2)			526,150	828,622
Connecticut	(2)	(2)							(2)	(2)
Delaware			72,050	180,113			5,000	$10,000	77,050	190,113
Georgia	65,700	105,257	4,740,360	6,167,500	265,720	$290,603	123,430	79,338	5,195,210	6,642,698
Idaho	8,270	6,400	15,200	22,040					23,470	28,440
Maine	12,310	12,914	18,310	55,188					30,620	68,102
Maryland	13,750	46,500	67,500	115,547					81,250	162,047
Massachusetts	(2)	(2)	375,240	611,814			(2)	(2)	490,070	657,854
Minnesota	3,840	3,520	84,580	107,460	330,100	266,087	23,240	52,871	441,760	429,938
Missouri	920	1,153							920	1,153
Montana	(2)	(2)	36,380	35,040	(2)	(2)			117,200	115,920
New Hampshire	1,390	974	1,630	2,242			980	685	4,000	3,901
New Jersey			114,290	201,513	1,000	1,600			115,290	203,113
New York			15,000	21,900					15,000	21,900
North Carolina	(2)	(2)	4,526,400	6,350,643	(2)	(2)	(2)	(2)	4,986,320	7,295,526
North Dakota	(2)	(2)			(2)	(2)			(2)	(2)
Oklahoma							212,970	106,484	212,970	106,484
Oregon							(2)	(2)	(2)	(2)
Pennsylvania	4,500	10,358	581,300	1,034,967	94,050	183,397			679,850	1,228,722
Puerto Rico			19,500	19,500					19,500	19,500
Rhode Island	300	300					3,400	8,713	3,700	9,013
South Carolina	(2)	(2)	1,760,660	2,385,064	355,630	463,341	(2)	(2)	2,223,920	2,881,109
South Dakota			8,350	14,791					8,350	14,791
Vermont			2,020	3,721					2,020	3,721
Virginia	(2)	(2)	2,116,120	3,803,043	302,540	358,308	(2)	(2)	2,461,360	4,209,176
Washington	(2)	(2)	456,870	503,971			(2)	(2)	1,256,000	1,595,531
Wisconsin			120,280	94,836					120,280	94,836
Wyoming	(2)	(2)	39,150	26,730	(2)	(2)			(2)	(2)
Undistributed	1,242,690	1,479,110	1,374,010	1,367,784	1,581,040	1,866,678	592,930	855,050	1,089,260	1,210,165
Total	1,560,580	1,785,088	16,545,580	23,125,707	2,930,080	3,430,014	961,950	1,113,141	21,998,190	29,453,950
Average unit value		$1.14		$1.40		$1.17		$1.16		$1.34

[1] Includes stone used for fill material, poultry grit, road base, stone sand, and unspecified uses.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

BASALT AND RELATED ROCKS (TRAPROCK)

Commercial traprock normally includes basalt, gabbro, diorite, and other dark igneous rocks and is widely used in industry for concrete and road metal and for railroad ballast. It is also used for riprap and such "other uses" as fill material, roofing granules, etc. The sales of crushed and broken traprock in 1950 were 7 percent greater in quantity and 13 percent greater in value than in 1949. The sales of riprap declined both in tonnage and value, but all other uses showed an increase. The average unit value increased from $1.42 in 1949 to $1.50 in 1950. In 1950 New Jersey was the leading producer, followed by Washington, Oregon, Massachusetts, and Pennsylvania, in that order.

MARBLE

Large quantities of waste material, consisting either of defective blocks or cuttings and spalls from marble-dressing operations, accumulate in the processing of marble blocks. This byproduct material is marketed for the great variety of uses listed in footnote 1 of table 28. The average value varies from State to State, for the reason that in certain States a large proportion of this material is marketed for such high-priced products as terrazzo or marble flour, whereas in other States a considerable amount is sold for roadstone, concrete aggregate, or other relatively low priced uses. The average unit value for crushed and broken marble increased 30 cents to $8.58.

TABLE 28.—Marble (crushed and broken stone) sold by producers in the United States in 1950, by States [1]

State	Active plants	Short tons	Value	State	Active plants	Short tons	Value
Alabama	2	(2)	(2)	Texas	1	10,550	$278,500
Arkansas	1	500	$2,250	Utah	1	5,950	62,000
California	1	4,410	80,212	Virginia	1	(2)	(2)
Georgia	1	(2)	(2)	Washington	4	1,490	11,621
Maryland	1	9,080	153,281	Undistributed		94,100	425,596
Missouri	2	8,000	103,800				
New Jersey	1	4,000	104,000	Total	21	177,930	1,525,847
New York	1	19,230	192,270	Average unit value			$8.58
Tennessee	4	20,620	112,317				

[1] Includes stone used for agriculture, asphalt filler, cast stone, composition flooring, crushed stone, magnesia, mineral food, plaster, poultry grit, shingles, spalls, stucco, terrazzo, tile, whiting (excluding marble whiting made by companies that purchase their marble), and unspecified uses.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

LIMESTONE

Because of its wide distribution, chemical and physical properties, and relatively moderate production cost, limestone is used in the United States more than any other type of stone. Sales of limestone were reported to the Bureau of Mines from 45 States and 2 Territories in 1950. In 1950 limestone (excluding that used in manufacturing cement and lime) constituted 72 percent of the total crushed and broken stone produced in the United States. Sales of limestone for riprap, fluxing stone, concrete and road metal, railroad ballast, and miscellaneous uses showed increases over the previous year, while that of agricultural limestone decreased in 1950.

Details by States and uses are shown in table 30.

TABLE 29.—Basalt and related rocks (traprock) (crushed and broken stone) sold or used by producers in the United States in 1950, by States and uses

State	Riprap		Crushed stone: Concrete and road metal		Crushed stone: Railroad ballast		Other uses [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alaska	----------	----------	(2)	(2)	----------	----------	----------	----------	(2)	(2)
California	165,970	$166,864	1,055,830	$1,181,595	31,580	$20,097	39,650	$3,066	1,293,030	$1,371,622
Colorado	(2)	(2)	(2)	(2)	----------	----------	----------	----------	195,680	293,864
Connecticut	52,100	52,969	1,658,310	2,181,103	75,470	83,012	----------	----------	1,785,880	2,317,084
Hawaii	1,370	4,924	652,830	1,481,408	130	400	----------	----------	654,330	1,486,732
Idaho	18,240	3,382	444,880	675,061	----------	----------	570	1,500	463,690	679,943
Maine	----------	----------	35,520	89,854	----------	----------	----------	----------	35,520	89,854
Maryland	1,700	2,544	439,040	775,308	155,690	241,327	----------	----------	596,430	1,019,179
Massachusetts	85,660	70,872	1,810,970	2,366,616	226,000	267,361	52,820	127,451	2,175,450	2,832,300
Michigan	----------	----------	18,200	28,000	----------	----------	----------	----------	18,200	28,000
Minnesota	27,790	63,237	45,800	77,496	7,930	11,895	----------	----------	81,520	152,628
Montana	25,280	15,422	----------	----------	----------	----------	----------	----------	25,280	15,422
New Jersey	152,920	282,566	3,844,130	6,800,240	272,130	466,971	650	906	4,269,830	7,550,683
New York	150	146	1,243,980	2,225,066	84,510	122,066	----------	----------	1,328,640	2,347,278
North Carolina	----------	----------	97,560	160,802	----------	----------	----------	----------	97,560	160,802
Oregon	101,490	74,624	2,882,820	4,521,360	418,680	396,220	16,370	5,300	3,419,360	4,997,504
Pennsylvania	(2)	(2)	1,328,560	1,964,303	486,120	746,479	(2)	(2)	1,902,940	3,333,080
Puerto Rico	----------	----------	2,040	2,970	1,040	850	----------	----------	3,080	3,820
Rhode Island	----------	----------	(2)	(2)	----------	----------	----------	----------	(2)	(2)
Texas	----------	----------	(2)	(2)	(2)	(2)	----------	----------	(2)	(2)
Virginia	----------	----------	523,440	733,463	----------	----------	----------	----------	523,440	733,463
Washington	227,450	205,137	2,816,640	2,765,667	360,050	307,438	17,630	4,858	3,421,770	3,283,100
Wisconsin	1,280	3,295	43,850	74,523	(2)	(2)	(2)	(2)	(2)	(2)
Wyoming	----------	----------	----------	----------	----------	----------	92,750	64,713	92,750	64,713
Undistributed	216,950	325,439	276,110	505,651	48,820	44,862	170,040	1,467,058	473,110	1,504,666
Total	1,078,350	1,271,421	19,220,510	28,610,486	2,168,150	2,708,978	390,480	1,674,852	22,857,490	34,265,737
Average unit value	----------	$1.18	----------	$1.49	----------	$1.25	----------	$4.29	----------	$1.50

[1] Includes stone sold for fill material, roofing granules, and unspecified uses.
[2] Included with "Undistributed," to avoid disclosure of individual company operations.

TABLE 30.—Limestone (crushed and broken stone) sold or used by producers in the United States in 1950, by States and uses

State	Riprap		Fluxing stone		Crushed stone: Concrete and road metal		Crushed stone: Railroad ballast		Agriculture		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	6,500	$8,211	1,736,780	$2,076,658	259,740	$510,665			199,110	$271,632	245,830	$909,856	2,447,960	$3,777,022
Arizona			12,790	18,877	15,800	28,222					550	2,502	29,140	49,601
Arkansas	44,000	44,000	48,340	44,956	2,350,940	5,722,823	380	$342	26,830	36,220			2,470,490	5,848,341
California			(1)	(1)	252,100	253,289			(1)	(1)	577,950	2,069,915	1,059,020	2,808,822
Colorado	130	600	397,650	760,112	86,680	238,716					61,790	114,293	546,250	1,113,721
Connecticut			(1)	(1)	390	1,135			49,800	189,262	(1)	(1)	67,400	266,236
Florida					4,484,490	5,917,467	(1)	(1)	(1)	(1)	722,700	651,011	5,313,400	6,885,394
Georgia	(1)	(1)			286,240	421,941	(1)	(1)	231,920	451,001	255,570	1,268,101	806,490	2,171,355
Hawaii											21,880	15,452	21,880	15,452
Idaho			(1)	(1)							(1)	(1)	(1)	(1)
Illinois	297,630	337,234	931,670	1,213,746	10,346,430	11,736,091	1,088,920	1,164,596	4,052,220	5,187,513	1,183,150	2,300,228	17,900,020	21,939,408
Indiana	14,980	21,050	297,070	328,761	4,017,050	4,587,694	557,550	622,098	1,432,330	1,783,231	173,680	637,854	6,492,660	7,980,688
Iowa	107,170	114,146	20,880	28,976	6,457,030	7,539,927	4,220	4,640	1,742,830	2,500,539	90,840	455,159	8,422,970	10,643,387
Kansas	709,080	685,388			3,928,890	4,983,936	138,010	148,869	736,000	1,014,965	38,590	154,783	5,550,570	6,987,941
Kentucky	21,660	24,671			6,304,690	7,683,940	372,600	321,557	716,090	833,032	580	863	7,415,620	8,864,063
Louisiana											(1)	(1)	(1)	(1)
Maine	(1)	(1)			28,220	65,103			(1)	(1)	(1)	(1)	103,570	376,710
Maryland					1,135,020	1,524,529	42,000	54,600	23,800	86,130	1,120	2,802	1,201,940	1,668,061
Massachusetts	220	301	(1)	(1)	(1)	(1)			160,870	577,495	80,710	575,808	266,660	1,204,150
Michigan	(1)	(1)	11,645,570	8,340,669	2,657,880	2,340,243	(1)	(1)	649,250	822,422	3,818,710	3,501,329	18,985,420	15,265,084
Minnesota	9,010	13,211	1,000	1,750	1,118,990	1,168,015	1,000	1,750	138,150	173,002	108,430	182,436	1,376,580	1,540,164
Mississippi									100,000	115,000			100,000	115,000
Missouri	623,670	697,393	36,040	56,863	5,291,960	6,960,926	27,000	30,300	2,309,180	3,391,843	612,790	1,480,230	8,900,640	12,617,555
Montana	4,050	6,080	(1)	(1)	9,240	15,949	(1)	(1)			(1)	(1)	156,120	257,453
Nebraska	121,870	176,049			183,970	270,365			(1)	(1)	(1)	(1)	736,660	1,042,035
Nevada			(1)	(1)	(1)	(1)					(1)	(1)	(1)	(1)
New Jersey			(1)	(1)	20,010	43,144			(1)	(1)	(1)	(1)	282,450	1,257,583
New Mexico	25,000	15,600			42,940	20,910							67,940	36,510
New York	210,160	388,260	135,420	161,681	8,612,890	11,885,164	812,220	870,596	377,530	1,291,590	1,404,820	1,774,009	11,553,040	16,371,300
North Carolina					2,076,310	2,737,279	9,850	10,835	5,770	7,422			2,091,930	2,755,536
Ohio	72,670	86,385	6,938,350	6,836,766	8,817,600	10,108,577	1,244,160	1,363,392	1,703,400	2,549,393	1,438,190	2,987,053	20,214,370	23,931,566
Oklahoma	197,160	39,238	(1)	(1)	1,712,790	2,046,510	(1)	(1)	192,470	297,807	493,060	639,155	2,992,680	3,333,804
Oregon									36,130	56,272	82,240	91,118	118,370	147,390

For footnote, see end of table.

TABLE 30.—Limestone (crushed or broken stone) sold or used by producers in the United States in 1950, by States and uses—Con.

State	Riprap		Fluxing stone		Crushed stone: Concrete and road metal		Crushed stone: Railroad ballast		Agriculture		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Pennsylvania	124,060	$196,673	8,962,120	$12,129,620	8,713,460	$12,709,963	230,930	$295,918	938,030	$2,748,848	1,642,470	$3,586,141	20,611,070	$31,667,163
Puerto Rico					216,300	538,273	4,000	5,600			7,130	7,516	227,430	551,389
Rhode Island									25,000	112,500			25,000	112,500
South Carolina					215,710	300,737			103,720	176,919			319,430	477,656
South Dakota	3,990	5,490			341,830	612,337					5,500	11,000	351,320	628,827
Tennessee	277,310	376,839	47,500	60,869	5,832,400	7,173,106	643,280	623,923	734,220	977,373	345,330	759,621	7,880,040	9,971,731
Texas	80,280	81,836	309,380	296,169	2,318,250	2,525,621	376,790	295,758	78,280	64,864	597,660	621,972	3,760,640	3,886,220
Utah	1,000	1,000	(1)	(1)	121,000	36,367					(1)	(1)	680,930	651,959
Vermont	150	169	(1)	(1)	58,680	67,790	(1)	(1)	95,810	419,430	115,700	972,760	329,970	1,544,524
Virginia	2,420	1,873	222,590	315,551	3,432,110	4,638,509	401,150	390,157	805,990	1,289,511	1,016,330	2,028,627	5,880,590	8,664,228
Washington			(1)	(1)	(1)	(1)			24,260	115,084	124,760	321,971	154,330	442,680
West Virginia	105,320	126,387	3,093,340	3,745,841	859,370	1,326,425	385,690	415,629	85,810	143,942	171,770	482,167	4,701,300	6,240,391
Wisconsin	41,660	30,051	53,680	59,583	4,251,860	4,419,141	201,670	212,786	1,291,310	1,782,353	170,940	243,661	6,011,120	6,747,575
Wyoming	(1)	(1)	(1)	(1)	99,330	101,487	429,150	412,958			(1)	(1)	681,170	901,212
Undistributed	58,230	81,527	1,079,650	1,454,940	8,000	14,664	615,000	563,571	282,710	926,480	1,470,370	3,130,069	804,740	1,192,055
Total	3,159,380	3,559,662	35,969,820	37,932,388	96,966,590	123,276,980	7,585,570	7,809,875	19,348,820	30,393,075	17,081,140	31,979,462	180,111,320	234,951,442
Average unit value		$1.13		$1.05		$1.27		$1.03		$1.57		$1.87		$1.30

[1] Included with "Undistributed" to avoid disclosures of individual company operations.

TABLE 31.—Limestone (crushed and broken stone) sold or used by producers in the United States for miscellaneous uses, 1949–50

Use	1949		1950	
	Short tons	Value	Short tons	Value
Alkali works	6,022,240	$5,641,705	6,174,350	$5,869,819
Calcium carbide works	652,950	654,470	749,930	782,993
Coal-mine dusting	284,840	1,130,061	341,170	1,320,342
Filler (not whiting substitute):				
Asphalt	671,560	1,893,964	750,050	2,777,973
Fertilizer	666,260	1,361,999	616,840	1,160,535
Other	257,540	974,509	294,180	1,178,761
Filter beds	56,020	100,741	89,020	158,205
Glass factories	621,840	1,373,314	769,680	1,720,504
Limestone sand	1,241,340	1,196,921	773,010	787,547
Limestone whiting [1]	501,400	3,511,159	676,410	4,875,667
Magnesia works (dolomite) [2]	241,070	428,723	236,480	409,852
Mineral food	413,850	1,837,105	463,050	2,252,857
Mineral (rock) wool	42,600	50,737	18,290	23,551
Paper mills	417,850	766,856	431,940	942,439
Poultry grit	101,980	904,053	95,100	893,298
Refractory (dolomite)	[3] 806,980	[3] 922,311	1,040,530	1,216,933
Road base	934,720	710,369	1,344,400	1,157,231
Stucco, terrazzo, and artificial stone	47,670	505,268	73,130	762,889
Sugar factories	555,030	1,361,169	717,620	1,608,097
Other uses [4]	589,290	926,608	1,031,270	1,550,805
Use unspecified	[3] 719,860	[3] 982,929	394,690	529,164
Total	[3] 15,846,890	[3] 27,234,971	17,081,140	31,979,462

[1] Includes stone for filler for calcimine, caulking compounds, ceramics, chewing gum, explosives, floor coverings, foundry compounds, glue, grease, insecticides, leather goods, paint, paper, phonograph records, picture-frame moldings, plastics, pottery, putty, roofing, rubber, tooth paste, wire coating, and unspecified uses. Excludes limestone whiting made by companies from purchased stone.
[2] Includes stone for refractory magnesia.
[3] Revised figure.
[4] Includes stone for acid neutralization, athletic-field marking, carbon dioxide, chemicals (unspecified), concrete blocks and pipes, dyes, fill material, light bulbs, motion-picture snow, oil-well drilling, patching plaster, rayons, roofing granules, spalls, and water treatment.

Dolomite (calcium-magnesium carbonate) has a variety of uses, some quite distinct from those of high-calcium limestone. Dead-burned dolomite is used as a refractory lining for metallurgical furnaces; statistical data on this product (which is closely allied to lime) are given in the Lime chapter of this volume. Raw dolomite is also used as a refractory, particularly for patching furnace floors.

Sales of dolomite and its primary calcined product, dolomitic lime, are listed by consuming industry, in table 32.

TABLE 32.—Dolomite and dolomitic lime sold or used by producers in the United States for specified purposes, 1949–50

	1949		1950	
	Short tons	Value	Short tons	Value
Dolomite for—				
Basic magnesium carbonate [1]	241,070	$428,723	236,480	$409,852
Refractory uses	[2] 806,980	[2] 922,311	1,040,530	1,216,933
Dolomitic lime for—				
Refractory (dead-burned dolomite)	1,318,708	15,930,226	1,759,440	21,725,560
Paper mills	50,000	552,000	55,000	642,000
Total (calculated as raw stone) [3]	[2] 3,785,000	----------	4,906,000	----------

[1] Includes dolomite for refractory magnesia.
[2] Revised figure.
[3] 1 ton of dolomitic lime is equivalent to 2 tons of raw stone.

Table 33 shows the tonnages and values of fluxing stone sold for use in various metallurgical operations.

TABLE 33.—Sales of fluxing limestone, 1946–50, by uses

Year	Blast furnaces		Open-hearth plants		Other smelters [1]		Other metallurgical [2]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	19,674,130	$15,803,857	4,869,300	$4,342,467	449,050	$490,566	165,280	$154,943	25,157,760	$20,791,833
1947	25,817,270	22,000,942	6,059,440	5,862,292	512,880	593,811	180,680	230,905	32,570,270	28,687,950
1948	26,339,790	24,721,052	7,873,410	8,695,137	503,490	609,354	185,250	224,465	34,901,940	34,250,008
1949	[3] 23,768,970	[3] 24,127,897	5,922,020	6,929,134	728,960	835,962	332,370	374,649	[3] 30,752,320	[3] 32,267,642
1950	28,397,710	29,222,700	6,936,900	7,948,041	457,630	587,643	177,580	174,004	35,969,820	37,932,388

[1] Includes flux for copper, gold, lead, zinc, and unspecified smelters.
[2] Includes flux for foundries and for cupola and electric furnaces.
[3] Revised figure.

The statistics of the lime and cement industries are presented in separate chapters of the Minerals Yearbook and are not covered in the Stone chapter; however, a commodity review of limestone would be incomplete without suitable recognition of the large tonnage of limestone consumed by these industries. Consequently, table 34 shows the total tonnage consumed for all purposes.

TABLE 34.—Limestone sold or used for all purposes in the United States, 1948–50, in short tons

Use	1948	1949	1950
Limestone (as given in this report) (approximate)	166,742,000	163,746,000	180,919,000
Portland and natural cement and cement rock [1]	54,513,000	55,219,000	59,361,000
Lime [2]	14,528,000	12,637,000	14,980,000
Total	235,783,000	231,602,000	255,260,000

[1] Reported in terms of cement in Cement chapter of this volume.
[2] Reported in terms of lime in Lime chapter of this volume.

SANDSTONE

The sales of crushed and broken sandstone in 1950 increased 31 percent and the value 16 percent over the preceding year. The increases occurred in the production of refractory stone, in concrete and road metal, and in railroad ballast. Decreases occurred in riprap and "other uses." The grand average unit value, however, decreased 27 cents a ton to $2.00.

MISCELLANEOUS STONE

Crushed and broken stone, other than the five principal varieties already discussed, includes light-color volcanic rocks, schists, boulders from river beds, serpentine, chats, and flint. Table 36 shows the sales of stone by types in 1950. The output during 1950 increased 11 percent in quantity and 21 percent in value compared with 1949. California was the largest producer in 1950, followed by Oklahoma, Kansas, Missouri, and Arkansas in that order. The grand average unit value increased 7 cents to 88 cents a ton.

TABLE 35.—Sandstone (crushed and broken stone) sold or used by producers in the United States in 1950, by States and uses

State	Refractory stone (ganister)		Riprap		Crushed stone: Concrete and road metal		Crushed stone: Railroad ballast		Other uses [1]		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	(2)	(2)									(2)	(2)
Arkansas	(2)	(2)			(2)	(2)					180, 370	$235, 822
California	(2)	(2)	(2)	(2)	1, 224, 270	$1, 410, 721	(2)	(2)	(2)	(2)	1, 694, 950	1, 756, 339
Colorado	21, 030	$46, 353	1, 440	$3, 500	273, 880	246, 176			16, 500	$9, 900	312, 850	305, 929
Idaho							(2)	(2)			(2)	(2)
Illinois	(2)	(2)	(2)	(2)							650	8, 350
Kansas			244, 070	263, 877	134, 640	231, 863	128, 020	$158, 746	105, 020	138, 366	611, 750	792, 852
Kentucky					(2)	(2)					(2)	(2)
Maine					(2)	(2)					(2)	(2)
Massachusetts									(2)	(2)	(2)	(2)
Michigan					1, 630	2, 612					1, 630	2, 612
Minnesota			(2)	(2)							(2)	(2)
Montana							259, 260	241, 185	32, 150	3, 268	291, 410	244, 453
Nebraska			(2)	(2)							(2)	(2)
New Mexico			(2)	(2)	(2)	(2)	(2)	(2)			296, 670	206, 394
New York					57, 000	98, 000					57, 000	98, 000
North Carolina					(2)	(2)					(2)	(2)
Ohio	67, 820	611, 737	19, 650	45, 550					11, 570	8, 652	99, 040	665, 939
Oklahoma			10, 600	10, 600	1, 380	600			7, 500	7, 500	19, 480	18, 700
Pennsylvania	607, 030	2, 408, 300	150	462	1, 061, 960	1, 835, 863	181, 050	263, 476			1, 850, 190	4, 508, 101
South Dakota	32, 150	91, 182	(2)	(2)	724, 470	1, 288, 227	(2)	(2)			824, 320	1, 475, 409
Texas					109, 160	117, 342			18, 130	7, 300	127, 290	124, 642
Utah	(2)	(2)			(2)	(2)					193, 140	88, 014
Virginia	107, 360	290, 751	20, 000	30, 000	104, 450	158, 783	14, 950	14, 950	7, 640	8, 289	254, 400	502, 773
Washington			380	2, 628							380	2, 628
West Virginia	(2)	(2)	(2)	(2)	641, 480	1, 518, 688			(2)	(2)	666, 210	1, 585, 262
Wisconsin	(2)	(2)							(2)	(2)	630, 450	4, 161, 344
Wyoming			(2)	(2)					(2)	(2)	117, 380	96, 919
Undistributed	266, 890	1, 099, 768	109, 060	142, 314	681, 750	531, 293	546, 070	509, 955	983, 830	3, 792, 360	605, 830	770, 655
Total	1, 102, 280	4, 548, 091	405, 350	498, 931	5, 016, 070	7, 440, 168	1, 129, 350	1, 188, 312	1, 182, 340	3, 975, 635	8, 835, 390	17, 651, 137
Average unit value		$4. 13		$1. 23		$1. 48		$1.05		$3. 36		$2. 00

[1] Includes sandstone for fill material, filter stone, road base, roofing granules, spalls, stone sand, and unspecified uses.
[2] Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 36.—Miscellaneous varieties of stone (crushed and broken stone) sold or used by producers in the United States in 1950, by States and uses

State	Riprap		Crushed stone				Other uses [1]		Total	
			Concrete and road metal		Railroad ballast					
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alaska			(2)	(2)			(2)	(2)	(2)	(2)
Arizona			198,970	$89,909					198,970	$89,909
Arkansas	(2)	(2)	(2)	(2)	(2)	(2)			1,300,510	1,317,697
California	215,210	$200,640	4,841,120	5,331,627	245,760	$99,931	567,050	$584,534	5,869,140	6,216,732
Colorado	3,640	11,538	37,530	20,546			48,380	45,100	89,550	77,184
Georgia			15,720	15,180					15,720	15,180
Hawaii	(2)	(2)	(2)	(2)					(2)	(2)
Idaho			(2)	(2)	(2)	(2)			156,860	152,907
Illinois			3,430	3,431					3,430	3,431
Indiana	(2)	(2)	(2)	(2)					15,500	5,125
Iowa			(2)	(2)					(2)	(2)
Kansas [3]			38,760	17,542	1,242,470	375,552	142,060	60,766	1,423,290	453,860
Maine	1,770	1,765	112,260	112,265					114,030	114,030
Maryland	2,440	9,129	20,000	30,000			800	400	23,240	39,529
Massachusetts	(2)	(2)	(2)	(2)					266,750	401,782
Michigan			85,180	48,839					85,180	48,839
Minnesota			8,660	4,330					8,660	4,330
Missouri [3]	740	3,500	253,080	145,137	844,790	239,547	259,600	111,621	1,358,210	499,805
Montana					328,550	313,261			328,550	313,261
Nevada			274,310	269,178					274,310	269,178
New Hampshire			(2)	(2)					(2)	(2)
New Jersey			(2)	(2)					(2)	(2)
New York			(2)	(2)	(2)	(2)			(2)	(2)
North Carolina			343,160	401,873					343,160	401,873
North Dakota			(2)	(2)					(2)	(2)
Ohio			6,000	6,000					6,000	6,000
Oklahoma [3]			363,720	181,860	1,427,610	665,417	1,000	1,000	1,792,330	848,277
Oregon	40,250	28,297	234,980	346,312	9,080	11,943			284,310	386,552
Pennsylvania			226,700	375,458	(2)	(2)	(2)	(2)	245,550	484,556
Rhode Island			(2)	(2)					(2)	(2)
South Carolina			(2)	(2)					(2)	(2)
South Dakota							(2)	(2)	(2)	(2)
Texas	(2)	(2)	606,780	267,698	(2)	(2)	(2)	(2)	954,610	495,231
Utah			5,910	9,323	42,480	68,371			48,390	77,694
Vermont			(2)	(2)					(2)	(2)
Virginia			(2)	(2)			(2)	(2)	130,400	206,469

Washington	31, 120	26, 007	59, 250	75, 001	------------	------------	------------	------------	90, 370	101, 008
Wisconsin	------------	------------	(2)	(2)	------------	------------	(2)	(2)	7, 070	10, 876
Wyoming	------------	------------	1, 570	1, 326	------------	------------	------------	------------	1, 570	1, 326
Undistributed	399, 220	411, 222	1, 621, 830	2, 087, 708	660, 150	608, 332	400, 440	551, 385	837, 870	1, 227, 160
Total	694, 390	692, 098	9, 358, 920	9, 840, 543	4, 800, 890	2, 382, 354	1, 419, 330	1, 354, 806	16, 273, 530	14, 269, 801
Average unit value	------------	$1. 00	------------	$1. 05	------------	$0. 50	------------	$0. 95	------------	$0. 88

1 Includes stone used for agriculture, asphalt filler, fill material, refractory, road base, roofing granules, spalls, and unspecified uses.
2 Included with "Undistributed" to avoid disclosure of individual company operations.
3 Chats; figures collected by Amarillo, Tex., office of the Bureau of Mines. Also includes small quantity of stone.

MARKETS

Crushed stone is used principally as an aggregate in concrete for highway and building construction. It is to be expected, therefore, that sales of crushed stone will follow the trends of shipments of portland cement, area of new concrete pavement, and value of new construction. These relationships are shown in figure 3.

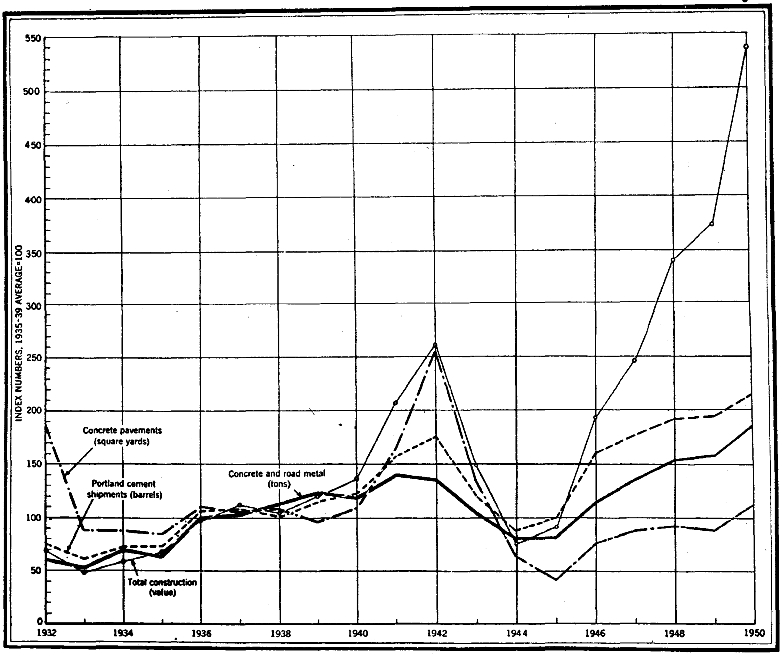

FIGURE 3.—Crushed-stone aggregates (concrete and road metal) sold or used in the United States compared with shipments of portland cement, total construction (value), and concrete pavements (contract awards, square yards), 1932–50. Data on construction and concrete pavements from Survey of Current Business.

The metallurgical industries in 1950 operated at a higher level than in 1949, and 1950 was a record year in the total sales of fluxing limestone, as shown in figure 4.

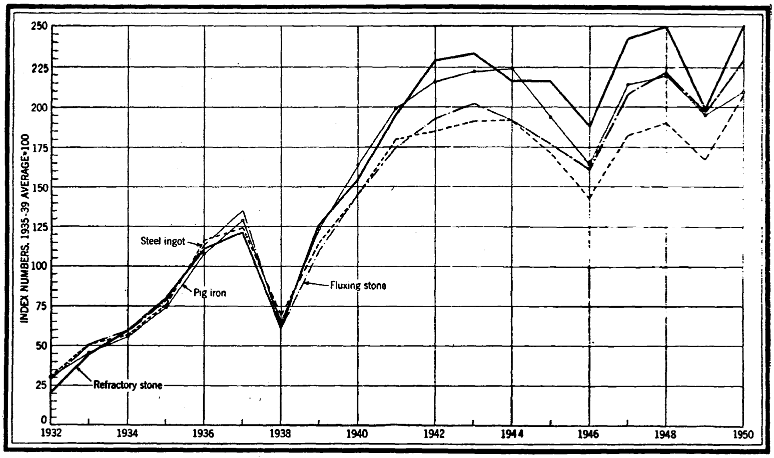

FIGURE 4.—Sales (tons) of fluxing stone and refractory stone (including that used in making lime) compared with production of steel ingot and pig iron, 1932-50. Statistics of steel-ingot production compiled by American Iron and Steel Institute.

TECHNOLOGY

The operation of a large traprock quarry in New Jersey and methods of stockpiling the various sizes of material were described in the technical press.[10] Many articles describing the new methods of blast-hole drilling that are coming into use have appeared in trade publications.[11]

The use of agricultural limestone was discussed in a trade paper.[12]

Underground mining practices of limestone deposits were reviewed.[13]

Methods of stockpiling and reclaiming stone were described.[14]

The operation of a single-stage stone crusher was the subject of a recent article.[15]

A review of a recent book on sedimentary rocks appeared in technical press.[16]

Methods of controlling tailings from washing plants were described.[17]

FOREIGN TRADE [18]

The importation of stone into the United States in 1950 increased slightly in both quantity and value in nearly all classifications. Marble slabs and paving tiles increased 132 percent in value in 1950, the largest such increase.

[10] Avery, William M., Kingston's New Plant: Pit and Quarry, vol. 42, No. 7, January 1950, pp. 78-82.

[11] Avery, William M., Thornton Quarry Testing New Continuous Blast-Hole Drill: Pit and Quarry, vol. 42, No. 9, March 1950, pp. 101-102.
Rock Products, Rotary Drill Speeds Quarry Output: Vol. 53, No. 6, June 1950, pp. 108-109.
Adamson, Patrick, Quarrying with Diamond Drills: Pit and Quarry, vol. 43, No. 2, August 1950, pp. 93-96.
Avery, William M., Rock-Drill Performance: Pit and Quarry, vol. 43, No. 2, August 1950, pp. 56-57.
Fulton, J. H., Douglas, A. G., and Beattie, J., Rock Drilling with Tungsten Carbide Bits: Canadian Min. and Metal. Bull., vol. 43, No. 457, May 1950, p. 254.

[12] Rock Products, The Agricultural Limestone Section: Vol. 53, No. 4, April 1950, pp. 102-134.

[13] Rock Products, Quarrying and Mining Practices: Vol. 53, No. 12, December 1950, pp. 112-115.

[14] Lenhart, Walter B., Stockpiling and Reclaiming Stone: Rock Products, vol. 53, No. 2, February 1950, pp. 107-110.

[15] Rock Products, Large Capacity with a Single Crusher: Vol. 53, No. 10, October 1950, pp. 128-129.

[16] Pettijohn, F. J., Sedimentary Rocks: Econ. Geol., vol. 44, No. 8, December 1949, pp. 745-746.

[17] Lenhart, Walter B., Control of Tailings from Washing Plants: Rock Products, vol. 53, No. 7, July 1950, pp. 72-80.

[18] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

The export trade in 1950, covering marble and other building and monumental stone, decreased 32 percent in quantity and 28 percent in value from the previous year. "Other manufactures of stone" decreased 23 percent in value.

TABLE 37.—Stone and whiting imported for consumption in the United States, 1949–50 [1] by classes

[U. S. Department of Commerce]

Class	1949		1950	
	Quantity	Value	Quantity	Value
Marble, breccia, and onyx:				
Sawed or dressed, over 2 inches thick...cubic feet..	[2] 1,521	$8,935	1,521	$5,990
In blocks, rough, etc...do....	130,331	590,202	131,557	587,894
Slabs or paving tiles...superficial feet..	208,709	129,884	464,493	301,684
All other manufactures		201,301		331,293
Total		930,322		1,226,861
Granite:				
Dressed...cubic feet..	[2] 9,257	67,226	34,404	126,452
Rough...do....	82,194	261,651	102,737	251,643
Paving blocks, wholly or partly manufactured number..			4,831	25,986
Total		328,877		404,081
Quartzite...short tons..	144,545	341,913	196,040	509,455
Travertine stone...cubic feet..	41,074	82,654	48,141	74,010
Stone (other):				
Dressed		8,462		14,840
Rough (monumental or building stone) cubic feet..	1,548	3,403	4,664	5,044
Rough (other)...short tons..	52,258	122,417	55,317	124,817
Marble chip or granito...do....	12,739	120,413	41,195	112,663
Crushed or ground, n. s. p. f.		7,734		2,225
Total		262,429		259,589
Whiting:				
Chalk or whiting, precipitated...short tons..	1,534	68,365	1,000	36,270
Whiting, dry, ground, or bolted...do....	7,818	124,065	11,985	149,789
Whiting, ground in oil (putty)...do....	(3)	56	(3)	105
Total		192,486		186,164
Grand total		2,138,681		2,660,160

[1] Data for 1948 (Minerals Yearbook, 1949, p. 1163) revised as follows: Marble sawed or dressed, over 2 inches thick, 648 cubic feet; in blocks, rough, etc., 109,335 cubic feet.
[2] Revised figure.

TABLE 38.—Stone exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Marble and other building and monumental stone		Other manufactures of stone (value)
	Cubic feet	Value	
1946	224,692	$463,572	$280,380
1947	320,016	583,826	549,591
1948	345,697	584,050	430,862
1949	211,334	523,171	436,705
1950	142,955	378,645	338,207

Sulfur and Pyrites

By G. W. Josephson and F. M. Barsigian [1]

GENERAL SUMMARY

FOR MANY years sulfur consumers have become accustomed to assuming that there would always be an ample supply available irrespective of demand. Therefore, it came as a real shock to the industrial world in 1950 when an acute shortage of sulfur developed. However, as noted in the Sulfur chapter of previous Minerals Yearbooks, consumption of elemental native sulfur has been greater than production since 1942. Stocks finally declined below safe working levels, and consequently it became necessary to restrict sales to conform with production. In the latter part of 1950 the major producers notified their customers of impending reductions in shipments, and preparations were made to place sulfur under Government export control.

TABLE 1.—Salient statistics of the sulfur industry in the United States, 1935–39 (average) and 1947–50, in long tons

	1935–39 (average)	1947	1948	1949	1950
Native sulfur:					
Production (from Frasch mines)	2,175,057	4,441,214	4,869,210	4,745,014	5,192,184
Apparent sales [1]	1,986,597	4,839,548	5,015,230	4,870,723	5,636,959
Imports	3,982	15	38	32	25
Exports:					
Crude	566,361	1,299,060	1,262,913	1,430,916	1,440,996
Treated	16,374	50,477	32,630	[2] 30,135	37,526
Apparent consumption	1,407,845	3,490,026	3,719,725	[2] 3,409,704	4,158,462
Producers' stocks at end of year	[3] 3,560,000	3,371,034	3,225,014	3,099,305	2,654,530
Pyrites:					
Production	544,144	940,652	928,531	888,388	931,163
Imports	433,485	126,553	107,411	120,937	208,766
Recovery as byproduct:					
Production of byproduct sulfuric acid (basis, 100 percent) at Cu, Zn, and Pb plants	504,280	647,497	572,719	511,854	661,529
Production of recovered elemental sulfur (basis, 100 percent S)	(4)	43,427	44,369	56,781	142,475
Other byproduct sulfur compounds (basis, 100 percent S)	(5)	20,631	25,792	37,935	39,889

[1] 1935–39 (average) represents mine shipments.
[2] Revised figure.
[3] Mine stocks only.
[4] Date not available. In 1939, 4,307 long tons were produced.
[5] Date not available. In 1939, 13,000 long tons were recovered.

In 1950 production of native sulfur in the United States and for the world as a whole attained a new record. Italian output increased somewhat, but high production costs and technical difficulties re-

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

stricted the rate of output to a relatively modest figure. This record output was insufficient to supply the demand, and producers' stocks continued to decline. In response to the growing demand for sulfur-bearing minerals, the output of pyrite also increased in 1950.

Prices of United States crude sulfur were increased moderately during the latter part of the year, but much greater increases took place in other countries.

As industry became conscious of the potential effect of sulfur shortages on the operations of both producers and consumers, a great many investigations of supply and some production expansion programs were started.

In an attempt to present the somewhat complex statistics of the sulfur industry more clearly, the tables in this chapter have been modified this year.

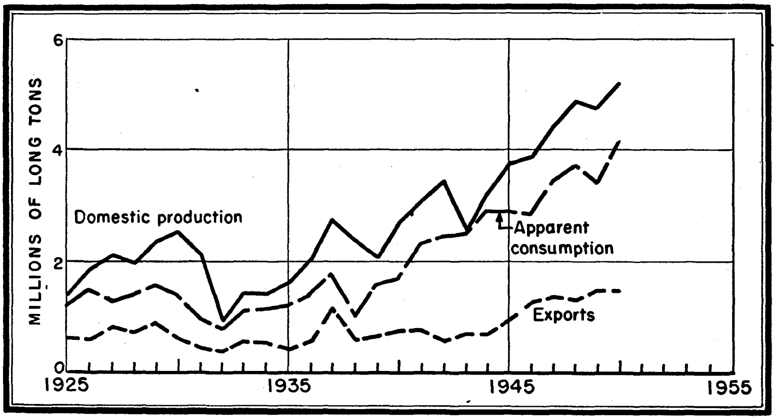

FIGURE 1.—Domestic production, apparent consumption, and exports of native sulfur, 1925–50, in long tons.

SULFUR

DOMESTIC PRODUCTION

In 1950 the United States sulfur industry produced 5,192,184 long tons of native sulfur from Frasch-process mines, 9 percent more than in the previous record year. Demand, particularly after the beginning of the Korean War, far exceeded output, and shipments from the mines totaled 5,504,714 long tons. In addition to the output of Frasch sulfur, a relatively small tonnage (3,327 long tons in 1950) is obtained by conventional mining methods from shallow deposits in California, Nevada, and Wyoming. This material is used principally for treating alkaline soils. Mines in Texas produced 76 percent of the total United States output in 1950, and Louisiana contributed 24 percent.

Several articles on sulfur-production methods were published during the year.[2]

[2] Gustafson, A. A., Thirteen Ways a Sulphur Producer Cut Costs and Improved Handling: Eng. and Min. Jour., vol. 151, No. 1, January 1950, pp. 68–70. Screw Crusher Solves Problems for Freeport: Mining Engineering, vol. 187, No. 10, October 1950, pp. 1026–1026A.

Industrial and Engineering Chemistry, A Half Century of the American Sulphur Industry: vol. 42, November 1950, pp. 2186–2302.

TABLE 2.—Production of sulfur and sulfur-containing raw materials by producers in the United States, in 1949–50, in long tons

	1949		1950	
	Gross weight	Sulfur content	Gross weight	Sulfur content
Native sulfur:				
From Frasch-process mines	4,745,014	4,745,014	5,192,184	5,192,184
From other mines	5,678	2,092	3,327	1,072
Total native sulfur	4,750,692	4,747,106	5,195,511	5,193,256
Recovered elemental sulfur:				
Brimstone	53,922	53,853	139,731	139,352
Paste	6,454	2,928	6,452	3,123
Total recovered elemental sulfur	60,376	56,781	146,183	142,475
Pyrites (including coal brasses)	888,388	378,456	931,163	392,788
Byproduct sulfuric acid (basis, 100 percent) produced at Cu, Zn, and Pb plants	511,854	167,000	661,529	216,000
Other byproduct-sulfur compounds [1]	44,369	37,935	42,829	39,889
Total equivalent sulfur		5,387,278		5,984,408

[1] Primarily hydrogen sulfide used in making sulfuric acid.

TABLE 3.—Sulfur produced and shipped from Frasch mines in the United States, 1946–50

Year	Produced (long tons)			Shipped	
	Texas	Louisiana	Total	Long tons	Approximate value
1946	2,975,472	884,170	3,859,642	4,128,212	$66,100,000
1947	3,561,214	880,000	4,441,214	4,828,103	85,200,000
1948	3,867,545	1,001,665	4,869,210	4,978,912	89,600,000
1949	3,610,829	1,134,185	4,745,014	4,789,311	86,200,000
1950	3,949,164	1,243,020	5,192,184	5,504,714	104,000,000

California.—The only sulfur production in California in 1950 came from the Crater claims in Inyo County operated by Roy E. Kitching. The Siskon Mining Corp. reported that the Leviathan mine was optioned in 1950 to Anaconda Mining Corp. It may be operated as a source of sulfur for a copper operation.

Colorado.—Ben E. Warren produced sulfur ore in Delta County, Colo.

Louisiana.—A new record was established in 1950 for sulfur output in Louisiana. A total of 1,243,020 long tons was produced by the Freeport Sulphur Co. from the Grande Ecaille mine. Jefferson Lake Sulphur Co. acquired sulfur rights on Starks Dome in Calcasieu Parish and began construction of a plant on the property.

Nevada.—W. S. Peterson operated a sulfur mine in Humboldt County, Nev.

TABLE 4.—Sulfur ore (10–70 percent S) produced and shipped for agricultural use in the United States, 1946–50, in long tons [1]

Year	Produced (long tons)	Shipped	
		Long tons	Value
1946	6,907	6,344	$95,531
1947	4,082	4,303	65,124
1948	1,832	1,700	30,220
1949	5,678	5,392	101,991
1950	3,327	3,247	60,115

[1] 1946–48: California, Colorado, Nevada, and Texas; 1949–50: California, Colorado (1949 only), Nevada' and Wyoming.

Texas.—In 1950 sulfur was produced in Texas by the following firms: Duval Sulphur & Potash Co. (formerly Duval Texas Sulphur Co.) at Orchard Dome, Fort Bend County; Freeport Sulphur Co., at Hoskins Mound, Brazoria County; Jefferson Lake Sulphur Co., Inc., at Clemens Dome, Brazoria County, and Long Point Dome, Fort Bend County; and Texas Gulf Sulphur Co., at Boling Dome, Wharton County, and at Moss Bluff Dome, Liberty County. The Texas Gulf Sulphur Co. drilled test holes at Spindletop Dome near Beaumont, Tex.; and, as a commercial deposit was found, plant construction was begun in October. The difficulty of maintaining current high production rates was indicated by Texas Gulf Sulphur when it reported that in 1950 production at Boling Dome was at a rate about 150 percent of normally expected capacity.

TABLE 5.—Sulfur produced in Texas in 1950, by companies, in long tons

Company	First quarter	Second quarter	Third quarter	Fourth quarter	Total
Texas Gulf Sulphur Co	687,307	836,956	852,738	776,621	3,153,622
Freeport Sulphur Co	78,295	79,835	77,040	81,060	316,230
Jefferson Lake Sulphur Co., Inc	59,207	61,883	79,142	77,605	277,837
Duval Sulphur & Potash Co	51,465	51,555	47,815	50,640	201,475
Total	876,274	1,030,229	1,056,735	985,926	3,949,164.

Wyoming.—Sulfur ore was produced by the Cody Sulphur Co. at Cody in Park County. The Wyoming Gulf Sulphur Co. is reported to be the owner of Cody Sulphur Co. The Star Mining Co. at Afton in Lincoln County was inactive. The growing sulfur shortage revived interest in the surface deposits that occur in several areas in Wyoming. The Continental Sulphur & Phosphate Corp. explored the deposit in Sunlight Valley.

RECOVERY AS BYPRODUCT

To date the principal sources of sulfur in the United States have been the native sulfur deposits and pyrites as a primary product. This direct production of sulfur minerals is supplemented by substantial and growing tonnages recovered as byproducts of a variety of industrial operations. Large tonnages of byproduct-pyrite flotation concentrates are recovered in the milling of copper, zinc, and lead ores. The quantities of coal brasses washed out of midwestern coal are relatively large, but only a small amount is recovered for use as a sulfur raw material. The statistics of the byproduct pyrites are included in the Pyrites section of this chapter.

In the smelting of metal sulfide ores large volumes of sulfur-bearing gases are released, and a portion is recovered in the form of sulfuric acid. In 1950 the equivalent of 216,000 long tons of sulfur (167,000 long tons in 1949) was recovered from smelters. Table 6 shows the output of acid at smelters during the past 5 years. Recovery declined considerably after World War II but increased in 1950, and further increases are anticipated. Early in the year acid recovery was begun by the American Smelting & Refining Co. at its Tacoma smelter.

TABLE 6.—Byproduct sulfuric acid (basis, 100 percent) produced at copper, zinc, and lead plants in the United States, 1946–50, in short tons

	1946	1947	1948	1949	1950
Copper plants [1]	171,687	126,494	111,967	96,344	131,342
Zinc plants	544,529	598,703	529,478	476,932	609,571
Total	716,216	725,197	641,445	573,276	740,913

[1] Includes sulfuric acid produced as byproduct at a lead smelter.

The total tonnage of sulfur evolved as fumes from a great many other industrial operations is enormous, but in most cases the gases are either too dilute or too minor in quantity at the individual locations to permit profitable recovery. However, with growing demand, increasing prices, and other advantages, such as nuisance elimination, the outlook is for a considerable increase of byproduct recovery. The principal increase in elemental sulfur recovery in recent years has taken place in the processing of sour natural and refinery gases. The Texas Gulf Sulphur Co. began production of sulfur in 1950 in a plant at Worland, Wyo., using sour gas having a very high hydrogen sulfide content. This plant is the largest of its kind. Freeport Sulphur Co. brought a plant recovering sulfur from refinery gases near Westville, N. J., into production. At the end of the year, owing to the sulfur shortage, many other firms, principally oil companies, were proceeding with sulfur-recovery projects.

In 1950, 142,475 long tons of elemental sulfur were recovered in 10 States from coke-oven, refinery, natural, and other industrial gases. Shipments totaled 78,560 long tons, of which 96 percent was sold as brimstone and 4 percent as paste containing 40 to 57 percent sulfur. In addition, 42,829 long tons of hydrogen sulfide containing 39,889 long tons of sulfur were recovered and used principally in making sulfuric acid.

Statistics of byproduct sulfur production are summarized in table 2.

CONSUMPTION AND USES

Although it became increasingly difficult to obtain during the last half of the year, domestic consumption of native sulfur in 1950 apparently reached a new record, 12 percent above the previous high. A small portion of the apparent consumption of native sulfur (4,158,-

462 long tons) shown in table 7 may have gone into consumers' stocks. The comparable estimate of consumption made by Chemical Engineering was 4,066,000 long tons.

The apparent domestic consumption of sulfur in all forms, including pyrite, hydrogen sulfide, etc., as shown in table 8, is estimated to have totaled almost 5,000,000 tons in 1950.

Consumers were notified by producers in the fall that future shipments would be reduced in various ways. For example, Texas Gulf Sulphur Co. stated that its shipments would be on the basis of 80 percent of the annual maximum tonnage purchasable from the company under the terms of contracts.[3]

TABLE 7.—Apparent consumption of native sulfur in the United States, 1946–50, in long tons

	1946	1947	1948	1949	1950
Apparent sales to consumers [1]	4,094,191	4,839,548	5,015,230	4,870,723	5,636,959
Imports	35	15	38	32	25
Total	4,094,226	4,839,563	5,015,268	4,870,755	5,636,984
Exports:					
Crude	1,189,072	1,299,060	1,262,913	1,430,916	1,440,996
Refined	56,748	50,477	32,630	[2] 30,135	37,526
Total	1,245,820	1,349,537	1,295,543	[2] 1,461,051	1,478,522
Apparent consumption	2,848,406	3,490,026	3,719,725	[2] 3,409,704	4,158,462

[1] Calculated from production and change in stocks during the year.
[2] Revised figure.

TABLE 8.—Apparent consumption of sulfur in all forms in the United States, 1946–50, in long tons [1]

	1946	1947	1948	1949	1950
Native sulfur	2,848,400	3,490,000	3,719,700	3,409,700	4,158,500
Recovered sulfur shipments	35,000	43,400	54,300	42,300	78,600
Pyrites:					
Domestic production	337,500	392,700	388,400	378,500	392,800
Imports	87,800	60,800	51,600	58,000	100,200
Total pyrites	425,300	453,500	440,000	436,500	493,000
Smelter acid production	209,000	212,000	187,000	167,000	216,000
Other production	18,400	20,600	25,800	37,900	39,900
Total	3,536,100	4,219,500	4,426,800	4,093,400	4,986,000

[1] Crude sulfur or sulfur equivalent.

[3] Texas Gulf Sulphur Co., Annual Report 1950.

Native sulfur consumption (*see* table 9) has been estimated by Chemical Engineering in a pattern somewhat different from the form used in past years. The revised form is particularly useful, as it separates the acid from nonacid uses.

TABLE 9.—Native sulfur consumed in the United States, 1948–50, by uses, in thousands of long tons

[Chemical Engineering]

Use	1948	1949	1950
Chemicals:			
H_2SO_4	2,631	2,622	2,916
CS_2	170	160	200
SO_2	18	16	20
Other	82	69	105
Sulfite pulp	350	295	375
Other wood pulp	50	50	60
Rubber	75	60	75
Insecticides and fungicides	125	125	140
Other uses	155	125	175
Total	3,656	3,522	4,066

As shown in tables 9 and 10, there was a general surge in consumption throughout industry in 1950. Increases were registered in all the uses listed.

TABLE 10.—Sulfuric acid (basis, 100 percent) consumed in the United States, 1949–50, by industries, in thousands of short tons

[Chemical Engineering]

Industry	1949 [1]	1950	Industry	1949 [1]	1950
Fertilizers:			Iron and steel	500	620
Superphosphate	3,880	3,950	Other metals	325	350
Byproduct $(NH_4)_2SO_4$	550	615	Explosives	123	130
Synthetic $(NH_4)_2SO_4$	614	760	Textiles	75	85
Chemicals	1,450	1,960	Miscellaneous	378	390
Petroleum refining	1,360	1,490			
Paints and pigments	785	985	Total	10,700	12,100
Rayon and film	660	765			

[1] Revised figures.

No comprehensive record of the geographical distribution of sulfur consumption is available, but some idea can be obtained from sulfuric acid production statistics, as about three-fourths of domestic sulfur is converted into acid. Table 11, compiled from reports of the Bureau of the Census, shows the production of sulfuric acid in specified regions and States in recent years.

TABLE 11.—Production of new sulfuric acid (100 percent H_2SO_4), by geographical divisions and States, 1948–50, in short tons

Division and State	1948	1949	1950
New England [1]	188,243	158,675	201,281
Middle Atlantic:			
Pennsylvania	735,467	619,923	772,103
New York and New Jersey	1,311,898	1,136,654	1,357,087
Total Middle Atlantic	2,047,365	1,756,577	2,129,190
North Central:			
Illinois	964,596	868,235	993,759
Indiana	429,025	415,766	464,680
Ohio	665,478	617,673	672,190
Other [2]	555,344	618,032	741,998
Total North Central	2,614,443	2,519,706	2,872,627
South:			
Alabama	307,393	309,385	290,494
Florida	370,078	459,369	526,273
Georgia	218,463	232,005	223,949
North Carolina	155,159	163,446	159,466
South Carolina	212,704	204,203	188,993
Virginia	540,502	486,720	560,644
Kentucky and Tennessee	774,042	795,728	853,475
Texas	613,447	880,330	972,260
Delaware and Maryland	([3])	([3])	1,354,643
Other [4]	1,958,879	2,050,983	980,179
Total South	5,150,667	5,582,169	6,110,376
West [5]	736,217	709,849	829,317
Total United States	10,736,935	10,726,976	12,142,791

[1] Includes data for plants in Connecticut, Maine, Massachusetts, and Rhode Island.
[2] Includes data for plants in Iowa (1949 only), Kansas (1950 only), Michigan, Missouri, and Wisconsin.
[3] Included with "Other."
[4] Data includes plants in Arkansas, Delaware (1948–49 only), Louisiana, Maryland (1948–49 only), Mississippi, Oklahoma, and West Virginia.
[5] Includes data for plants in Arizona, California, Colorado, Montana, Utah, Washington, and Wyoming.

STOCKS

Producers' stocks have declined steadily since 1942, when they were reported to have totaled 5,114,000 long tons. By the end of 1950, they had decreased to 2,654,530 long tons, of which 2,388,113 were at the mines. Mine stocks at the end of 1949 have been revised upward by 50,491 tons to a total of 2,700,643 long tons, and stocks away from the mines have been reduced by the same amount owing to a change in classification of certain stocks by one of the producers.

PRICES

In 1950 crude sulfur price quotations for most of the year held at $18 per long ton f. o. b. mine for domestic consumption and $22 f. o. b. Gulf ports for export. However, in the last quarter price increases were announced, one of the major companies quoting $21 and the other $22 per long ton f. o. b. mine for domestic sale. Export prices ranged from about $24.50 to $27.

Even more noteworthy were the upward trends of prices in foreign countries. Even the highest-cost material that had previously been accumulating now found a ready market at prices reported to be triple that for United States crude.

FOREIGN TRADE

In 1950 the foreign demand for American sulfur far exceeded the supply. To serve these needs, a record total of 1,478,522 long tons of crude and refined sulfur was exported during the year, but producers warned foreign consumers of future reductions. The Office of International Trade of the Department of Commerce prepared to place sulfur under an export-control quota in the first quarter of 1951.

As shown in table 12, sulfur imports were negligible. Small tonnages of sulfur ore are said to be brought in from Mexico for use on alkaline soils in southern California.

TABLE 12.—Sulfur imported into and exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Imports				Exports			
	Ore		In any form, n. e. s.		Crude		Crushed, ground, refined, sublimed, and flowers	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1946	(1)	$20	35	$11,226	1,189,072	$21,589.966	56,748	$2,624,873
1947	----------	----------	15	5,014	1,299,060	25,388,093	50,477	2,318,956
1948	----------	----------	38	13,299	1,262,913	26,779,444	32,630	1,774,358
1949	5	89	27	5,768	1,430,916	[2] 30,489,876	[2] 30,135	1,682,965
1950	----------	----------	25	6,172	1,440,996	30,950,531	37,526	2,249,311

[1] Less than 0.5 ton.
[2] Revised figure.

TABLE 13.—Sulfur exported from the United States, 1949–50, by countries of destination

[U. S. Department of Commerce]

Country	Crude				Crushed, ground, refined, sublimed, and flowers			
	1949		1950		1949		1950	
	Long tons	Value	Long tons	Value	Pounds	Value	Pounds	Value
North America:								
Canada-Newfoundland	253,403	$4,956,488	354,501	$7,099,009	5,860,886	$172,873	5,209,337	$199,499
Central America	81	2,546	139	4,548	595,467	21,352	896,469	31,530
Mexico	3,149	90,109	2,160	62,598	8,349,777	194,865	16,899,020	484,398
West Indies	35,750	701,764	35,499	772,978	116,179	6,209	431,781	16,631
Total North America	292,383	5,750,907	392,299	7,939,133	14,922,309	395,299	23,436,607	732,058
South America:								
Argentina	15,043	330,946	24,097	548,770	126,618	23,242	31,000	6,737
Brazil	47,238	1,060,057	59,979	1,362,378	5,198,692	181,499	13,418,373	403,782
Colombia	290	9,332	2,412	83,971	601,502	36,295	628,190	20,492
Ecuador	100	3,100	50	1,600	383,033	10,309	162,765	6,067
Peru	----------	----------	----------	----------	2,676,218	81,050	1,789,943	43,814
Uruguay	4,500	99,000	----------	----------	107,100	2,710	----------	----------
Venezuela	56	1,898	130	4,816	91,298	3,904	230,354	15,140
Other South America	----------	----------	----------	----------	10,600	1,261	236,110	7,100
Total South America	67,227	1,504,333	86,668	2,001,535	9,195,061	340,270	16,496,735	503,132

TABLE 13.—Sulfur exported from the United States, 1949–50, by countries of destination—Continued

[U. S. Department of Commerce]

Country	Crude				Crushed, ground, refined, sublimed, and flowers			
	1949		1950		1949		1950	
	Long tons	Value	Long tons	Value	Pounds	Value	Pounds	Value
Europe:								
Austria	10,022	$220,484	23,617	$528,119				
Belgium-Luxembourg	85,932	1,783,046	56,582	1,252,491	395,187	$8,784	557,626	$10,476
France	150,891	3,355,082	95,350	2,141,699	3,350	244		
Germany	27,440	606,832	25,133	563,076	3,500	950		
Greece					54,860	1,456	14,705,410	282,206
Netherlands	1,500	33,000	500	11,000	1,733,931	30,789	491,427	9,698
Norway	19	912	39	1,877	3,000	113	10,400	2,496
Portugal	198	4,900	200	4,900	3,300	528	15,200	4,994
Spain			5,000	110,000	8,700	1,871		
Sweden	9,690	213,180	7,690	171,780	241,149	6,086	115,800	3,603
Switzerland	17,400	382,800	15,900	359,100	515,324	19,847	495,438	25,396
United Kingdom	393,511	8,337,931	420,024	8,902,084			3,000	717
Other Europe	3,500	77,000			450	113	4,400	1,045
Total Europe	700,103	15,015,167	650,035	14,046,126	2,962,751	70,781	16,398,701	340,631
Asia:								
Ceylon					100,045	2,251	947,141	21,118
China	652	18,676	639	17,819	2,084,619	58,085	3,100,729	63,375
Hong Kong	[1] 1,434	[1] 41,205	389	9,163	23,849,980	435,810	941,057	18,948
India	37,234	845,117	44,796	1,039,166	7,551,619	167,057	8,461,243	232,860
Indonesia	4,250	93,500	4,950	110,250	199,954	6,048	1,621,106	42,777
Iran	15,965	397,812						
Israel	2,540	64,213	956	21,606	2,264,872	48,477	2,946,875	64,543
Korea	[1] 4,074	[1] 101,925			174,890	5,423	2,204,600	37,258
Lebanon					43,600	1,036	350,486	7,131
Pakistan			645	16,796	[1] 1,026,738	29,079	416,447	10,407
Philippines	4	376			120,984	8,094	189,200	5,969
Syria							396,828	10,565
Taiwan							2,818,360	31,104
Other Asia	1,195	33,436	39	1,936	79,650	4,772	1,120	192
Total Asia	67,348	1,596,260	52,414	1,216,736	[1] 37,496,951	766,132	24,395,192	546,247
Africa:								
Algeria	14,270	313,940	16,170	355,700				
Angola					87,784	2,090		
Belgian Congo					152,922	3,725	111,830	3,049
Egypt			4,184	120,322			2,410,299	53,208
French Morocco	4,860	106,920	4,542	99,924				
Madeira Islands					44,000	1,870		
Mozambique	149	41,071			315,460	8,073		
Tunisia	1,360	29,920	10,300	226,600				
Union of South Africa	65,097	1,323,950	76,925	1,692,350	1,985,469	78,386	673,839	60,747
Total Africa	85,736	1,815,801	112,121	2,494,896	2,585,635	94,144	3,195,968	117,004
Oceania:								
Australia	146,419	3,230,008	68,299	1,502,585	77,800	5,467	58,400	4,677
New Zealand	71,700	1,577,400	79,160	1,749,520	262,850	10,872	76,198	5,562
Total Oceania	218,119	4,807,408	147,459	3,252,105	340,650	16,339	134,598	10,239
Grand total	1,430,916	30,489,876	1,440,996	30,950,531	[1] 67,503,357	1,682,965	84,057,801	2,249,311

[1] Revised figure.

WORLD REVIEW

Although native sulfur is produced in many countries, as shown in table 14 the bulk comes from only a few. It is estimated that in 1950 world output of native sulfur attained a new record of about 5,700,000 long tons. In addition, elemental sulfur produced from a variety of operations as a primary product or byproduct throughout the world (principally in the United States, Norway, Spain, and Germany) exceeded 350,000 long tons. Total elemental sulfur output, therefore, was well over 6,000,000 long tons in 1950.

TABLE 14.—World production of native sulfur, by countries,[1] 1945–50, in long tons

[Compiled by Helen L. Hunt]

Country [1]	1945	1946	1947	1948	1949	1950
Argentina	9,072	[2] 13,000	[2] 13,000	(3)	9,842	[2] 10,000
Bolivia (exports)	640	468	2,275	2,707	4,398	(3)
Chile	28,617	15,185	11,717	13,258	6,924	(3)
Colombia				592	793	1,461
Ecuador	102	26	23	43	16	[2] 27
France (content of ore)	2,672	2,083	8,427	6,648	(3)	(3)
Greece		1,000		(3)	(3)	(3)
Italy (crude) [4]	73,990	140,765	146,310	170,904	185,567	209,767
Japan	37,333	21,046	28,670	40,120	61,414	90,940
Mexico	[5] 7,100	(3)	3,200	2,100	(3)	(3)
Peru	1,197	363	779	971	271	(3)
Spain	4,840	4,000	3,600	2,500	5,000	7,600
Taiwan (Formosa)	34	280	508	1,719	344	72
Turkey (refined)	4,088	2,970	2,620	2,556	3,046	5,708
United States	3,753,188	3,859,642	4,441,214	4,869,210	4,745,014	5,192,184
Total (estimate)	[1] 4,000,000	4,200,000	4,800,000	5,300,000	5,200,000	5,700,000

[1] Native sulfur is believed also to be produced in China (continental), Egypt, Guatemala, India, Indonesia, Israel-Jordan, and U. S. S. R., but complete data are not available; estimates by senior author of chapter included in total.
[2] Estimate.
[3] Data not available; estimate by author of chapter included in total.
[4] In addition the following tonnages of ground sulfur rock (30 percent "S") were produced and used as an insecticide: 1945, 26,254 tons; 1946, 12,592 tons; 1947, 18,716 tons; 1948, 15,176 tons; 1949, 19,213 tons; 1950, 15,778 tons.
[5] Incomplete data.

Canada.—Petroleum developments in western Canada promise to increase sulfur output. Natural gases in the Jumping Pound and Pincher Creek areas of Alberta contain high percentages of hydrogen sulfide. Potential sulfur recovery was estimated at over 200,000 long tons a year, and the prospect of commercial development was being investigated.[4]

Colombia.—Sulfur is produced by Industrias Purace from a deposit at an altitude of 12,000 feet on the slopes of Purace Volcano, east of the town of Popayan. The deposit has been estimated to contain 12,000,000 tons of ore averaging 40 percent sulfur. The ore is hand-mined by pick and shovel and fed at about 1 ton per hour to a retort furnace yielding approximately 200 tons of high-quality sulfur per month. The product is consumed in Colombia. It is distributed in bags by truck to sugar refineries, sulfuric acid plants, and other consumers. To modernize the operation, the company in 1950 was preparing to use power equipment in mining and had ordered a new treatment plant having a capacity of 1,000 tons per month. The new plant was scheduled to be completed in 1951.[5]

France.—Early in 1950 it was reported that sulfur mines in France were experiencing a decline. Ste. Languedocienne de Recherches Miniéres was conducting a mineral development program. Ste. de Mines de Soufre d'Apiqui was nearly inactive in 1949.[6] Output for

[4] Chemical and Engineering News, vol. 28, No. 13, Mar. 27, 1950, p. 1040.
[5] Source: S. M. Anderson, chief, Latin American Division, Bureau of Mines.
[6] Chemical Age, French Sulfur: Vol. 62, No. 1592, Jan. 14, 1950, p. 92.

the full year 1950 is reported to have been about 8,000 long tons, approximately the same as in 1949.

Italy.—The sulfur shortage is providing Italy with at least a temporary solution to its marketing problem. In recent years its production costs (and consequently prices) have been so high that its sulfur was difficult to market internationally. In 1950, however, consumers were not disputing prices, and Italy could sell its current export surplus as well as its accumulated stock of Sicilian sulfur. A contract under which deliveries were made in 1950 is reported to have stipulated shipment of 150,000 long tons of sulfur to Australia and New Zealand.[7] The price is said to have been about triple the f. o. b. mine price in the United States, and payment was in sterling.

Japan.—New ore bodies have been reported at the Azuma mine by Teikoku Sulphur Mining Co. and at the Ogushi mine by Hokkaido Sulphur Mining Co.[8]

Total output of sulfur increased by almost 50 percent to a total of 90,940 long tons in 1950.

Mexico.—Mexico is not now a major source of sulfur, but in 1950 there was a great deal of exploration and development that may lead to large production. Cia. Exploradora del Istmo, a subsidiary of Texas Gulf Sulphur Co., began an extensive drilling program in the State of Vera Cruz, where a number of promising salt-dome structures are known to exist. By the end of the year no commercial discovery had been reported.

The Mexican Gulf Sulphur Co. was making financial arrangements for the commercial development of the sulfur deposit its previous exploration had found in the San Cristobal Dome.

The Pan American Sulphur Co. (Gulf Sulphur Co. de Mexico, S. A.) was proceeding with its exploration of the large Jaltipan Dome.

Petroleos Mexicanos installed a plant to recover sulfur from sour gas in the Poza Rica oil field. Its daily capacity was reported to be about 140 tons.[9]

Turkey.—Flotation tests on sulfur from a new ore body at Keciburlu have been successful, and construction of a 10,000 ton annual capacity plant is contemplated.[10]

PYRITES

DOMESTIC PRODUCTION

After declining moderately during the previous 2 years, production of pyrites increased in 1950. Output was about 5 percent greater than in 1949. Virtually all was consumed in making sulfuric acid, principally in captive operations. In 1950, producing companies consumed 763,843 long tons and sold 129,119 long tons.

The increased pyrite output in 1950 was not large but may mark a turning point in the industry. In recent years producers have had difficulty competing with crude sulfur, but when the shortage developed consumers began to take a renewed interest in pyrites. A change

[7] Engineering and Mining Journal, vol. 151, No. 5, May 1950, p. 146.
[8] Mining World, vol. 12, No. 2, February 1950, p. 40.
[9] International Financial News Survey, Mexico's Sulphur Production: Vol. 3, No. 41, Apr. 27, 1951, p. 331.
[10] Mining World, vol. 13, No. 7, June 1951, p. 44.

from sulfur to pyrites as a raw material requires substantial modifications in equipment and also serious financial problems. However, if—as consumers were beginning to suspect—demand is increasing beyond the ability of Frasch mines to supply, a trend toward pyrite can be anticipated.

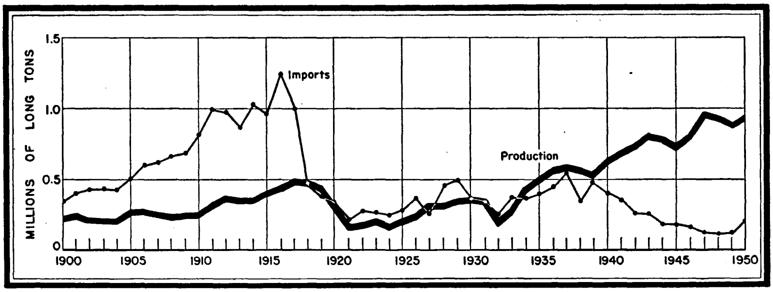

FIGURE 2.—Domestic production and imports of pyrites, 1900-50.

TABLE 15.—Pyrites (ores and concentrates) produced in the United States, 1945–50

Year	Quantity		Value	Year	Quantity		Value
	Gross weight (long tons)	Sulfur content (percent)			Gross weight (long tons)	Sulfur content (percent)	
1945	722,596	41.0	$2,700,000	1948	928,531	41.8	$3,950,000
1946	813,372	41.5	3,228,000	1949	888,388	42.6	3,904,000
1947	940,652	41.7	4,070,000	1950	931,163	42.2	4,059,000

California.—The Mountain Copper Co., Ltd., produced pyrites from its Hornet mine in Shasta County, Calif.

Colorado.—The Empire Zinc Division of the New Jersey Zinc Co., Eagle County, and Climax Molybdenum Co., Lake County, produced pyrites in Colorado in 1950. The Rico Argentine Mining Co., Dolores County, did not report any commercial production for 1950.

Indiana.—Output of pyrite (coal brasses) by the Snow Hill Coal Corp. at the Talleydale mine, Vigo County, increased in 1950.

Montana.—Production of byproduct pyrites at the copper-plant operations of Anaconda Copper Mining Co., Anaconda, Deer Lodge County, made Montana the third-largest producing State in 1950.

New York.—Pyrites output at the Balmat mine of St. Joseph Lead Co. in St. Lawrence County, N. Y., decreased in 1950.

Pennsylvania.—The Bethlehem Cornwall Corp. produced pyrites at its concentrator in Lebanon County, Pa.

Tennessee.—The Tennessee Copper Co., in the Ducktown area, Polk County—the largest producer of pyrites in the United States—increased its production in 1950. The pyrites concentrate was used by the company in the production of sulfuric acid and sinter.

Virginia.—Pyrites were produced by the General Chemical Co. at the Gossan mines to supply its sulfuric acid plant at Pulaski. Virginia was the second-largest pyrites producing State in 1950.

PRICES

Pyrites prices vary widely. In 1950 producers reported f. o. b. mine valuations from $1.12 to $6.95 per ton. The average value of all domestic output was $4.36, and the average value of the tonnage sold was $5.37 per ton. Spanish pyrites was quoted nominally by Oil, Paint and Drug Reporter at $8 per ton c. i. f. Atlantic ports and by E&MJ Metal and Mineral Markets at $0.14 to $0.16 per long ton unit.

FOREIGN TRADE

Receipts of pyrites from Spain, once our principal supplier, have dwindled in recent years, and in 1950 none was reported. Canada now supplies nearly all the pyrites imported into the United States. In 1950 pyrites imports were nearly twice as great as in 1949 but were only half the 1935–39 average. Production is centered in eastern Canada and shipments enter through the Buffalo customs district to serve the U. S. market.

No exports of pyrites were reported in 1950.

TABLE 16.—Pyrites, containing more than 25 percent sulfur, imported for consumption in the United States, 1946–50, by countries

[U. S. Department of Commerce]

Country	1946		1947		1948		1949		1950	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Australia									22	$242
Canada	121,807	$269,179	85,094	$266,698	75,248	$169,551	107,951	$215,290	208,725	411,823
Malta, Gozo, Cyprus									19	57
Portugal			300	2,664						
Spain	61,086	170,053	41,159	106,136	32,163	89,994	12,986	36,331		
Total	182,893	439,232	126,553	375,498	107,411	259,545	120,937	251,621	208,766	412,122

TABLE 17.—Pyrites, containing more than 25 percent sulfur, imported for consumption in the United States, 1946–50, by customs districts, in long tons

[U. S. Department of Commerce]

Customs district	1946	1947	1948	1949	1950
Buffalo	121,807	36,610	66,385	106,862	208,569
Chicago					36
Connecticut		34	37		
Michigan					5
New York		300			41
Philadelphia	61,086	89,609	40,989	14,075	
Vermont					115
Total	182,893	126,553	107,411	120,937	208,766

WORLD REVIEW

The postwar revival of pyrites output continued in 1950. Demand was growing steadily, as the economies of various European and Asiatic countries—the principal pyrites consumers—became more productive. Reports are not available from a number of producing countries, but world pyrites output is estimated to have been about 11,200,000 metric tons in 1950.

TABLE 18.—World production of pyrites (including cupreous pyrites), by countries,[1] 1946–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1946		1947		1948		1949		1950	
	Gross weight	Sulfur content	Gross weight	Sulfur content	Gross weight	Sulfur content	Gross weight	Sulfur content	Gross weight	Sulfur content
Algeria	40,360	16,505	35,295	14,745	35,900	14,360	32,705	13,082	25,075	[2] 10,000
Australia	131,364	40,951	110,410	51,547	90,848	42,230	87,923	41,021	113,973	53,887
Austria	3,823	1,332	6,139	2,047	7,871	2,942	11,624	4,064	12,489	3,133
Brazil	(3)	(3)	3,600	[2] 1,500	3,600	[2] 1,500	(3)	(3)	(3)	(3)
Canada	183,191	87,577	161,718	74,967	166,985	79,039	227,227	106,667	(3)	(3)
China	(3)	(3)	64,876	29,200	42,907	19,300	(3)	(3)	(3)	(3)
Cyprus	294,052	141,145	611,800	293,664	589,772	283,091	942,808	452,548	[4] 655,059	[2] [4] 314,400
Czechoslovakia	7,999	2,880	6,002	[2] 2,200	3,195	[2] 1,200	(3)	(3)	(3)	(3)
Finland	126,310	55,627	152,268	66,891	177,512	79,170	180,040	80,409	[2] 210,000	[2] 95,000
France	218,510	86,597	196,180	76,417	181,683	82,238	205,909	[2] 86,000	(3)	(3)
French Morocco	(3)	(3)	(3)	(3)	70	34	202	95	1,470	[2] 690
Germany:										
Federal Republic	} 238,700	[2] 85,000	321,000	128,400	383,100	153,245	431,963	173,582	525,400	[2] 210,200
Soviet Zone			(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Greece	80,140	38,467	58,185	28,000	16,236	[2] 7,800	15,785	[2] 7,600	87,678	[2] 42,000
Italy	400,519	[2] 184,300	642,445	[2] 295,500	835,027	[2] 384,100	866,179	[2] 398,400	895,459	[2] 412,000
Japan	474,842	204,182	832,845	349,795	1,138,782	489,676	1,535,082	660,085	1,916,181	785,634
Norway	539,850	232,710	720,015	310,079	735,422	[2] 312,400	745,367	[2] 316,500	749,363	318,500
Poland	28,253	[2] 11,300	39,659	[2] 15,900	58,100	[2] 25,000	81,000	[2] 36,000	(3)	(3)
Portugal	314,976	[2] 141,740	388,827	174,972	561,136	[2] 252,500	622,925	[2] 280,300	613,522	276,085
Rumania	4,873	(3)	(3)	(3)	(3)	(3)	[2] 5,000	(3)	(3)	(3)
Southern Rhodesia	25,413	[2] 10,160	17,144	[2] 7,115	13,224	[2] 5,500	16,968	6,787	13,810	5,524
Spain	1,175,976	[2] 564,500	1,217,442	[2] 584,400	1,463,912	[2] 702,700	1,132,793	[2] 543,700	1,306,859	[2] 627,300
Sweden	280,208	136,781	310,571	147,602	392,033	181,987	424,007	205,085	(3)	(3)
Tunisia	2,775	1,275	6,345	2,855	2,851	1,297	2,920	[2] 1,300	1,150	[2] 500
Turkey	300	(3)	5,000	(3)	(3)	(3)	----------	----------	(3)	(3)
Union of South Africa	38,044	16,553	34,820	15,166	35,992	15,456	35,527	15,274	36,026	[2] 15,400
United Kingdom	20,959	8,400	10,106	4,100	11,800	[2] 4,720	[2] 13,181	[2] 5,270	(3)	(3)
United States	826,427	342,967	955,749	398,975	943,434	394,583	905,746	385,518	946,108	399,092
Yugoslavia	49,000	20,400	76,000	31,800	90,000	38,000	73,000	32,300	(3)	(3)
Total (estimate)	7,000,000	3,000,000	8,700,000	3,700,000	9,700,000	4,000,000	10,500,000	4,400,000	11,200,000	4,800,000

[1] In addition to countries listed, Belgium, Egypt, Hungary, India, Iran, Ireland, Kenya, Korea, U. S. S. R., and Uruguay produce or have produced pyrites, but production data are not available; estimates by senior author of chapter included in total.

[2] Estimate.

[3] Data not available; estimate by author of chapter included in total.

[4] Exports.

Australia.—In 1950 pyrite production in Australia increased to about 114,000 metric tons. Australia also recovers substantial tonnages of sulfuric acid from smelter gases; but well over half its sulfur supplies were obtained from abroad, principally the United States and Italy. Past efforts to increase its self-sufficiency have been only partly successful, but an extended shortage of native sulfur will add a new incentive.

Mount Morgan, Ltd., is reported to be interested in a relatively low-grade pyrite ore body being drilled in what is known as the Sugarloaf area. The deposit is believed to contain 10,000,000 tons.[11]

A large pyrite deposit was being explored by the Consolidated Zinc Corp. at Nairne, near Adelaide. The lode is several hundred feet wide.[12]

At Risdon the Electrolytic Zinc Co. has completed a large sulfuric acid plant utilizing roaster gases containing 8 percent sulfur dioxide.[13]

Canada.—Canada has ample pyrite resources to supply its sulfur requirements if necessary. Production was increased substantially in 1950 but principally for export to the United States. Paper companies, the major consumers of imported crude sulfur, began to show more interest in pyrites after curtailment of sulfur shipments was announced; but, as conversion to direct use of pyrites introduces difficult technical problems, there was no general move to convert. Other solutions to the supply problem promised to be more advantageous in some areas. International Nickel was preparing to recover liquid sulfur dioxide as a byproduct at Copper Cliff, Ontario, for use in the paper industry. Noranda Mines continued development of its method for recovering sulfur, sulfuric acid, and iron sinter from pyrite. The process, in which the pyrite is burned on a sintering machine, has been developed through the pilot-plant stage. The company was considering various possible sites for a plant, as location in an advantageous market area probably would be a strong factor in determining its commercial success. Noranda has enormous reserves of pyrites and has leased the nearby MacDonald pyrite deposit, reported to contain 18 million tons of ore averaging 80 percent pyrite.

Greece.—In 1949 pyrite output in Greece was very low—about 16,000 metric tons—but in 1950 it increased to over 87,000. Production facilities, which were damaged during the civil war, are being rehabilitated.

Japan.—Since the end of hostilities, Japanese pyrite production has made a great recovery. From 1946 to 1950 output increased from 474,842 metric tons to 1,916,181—almost the prewar level. Domestic requirements absorb the Japanese production.

Discovery has been reported of three major ore bodies at the Yanahara pyrite mine owned by the Dowa Mining Co., Okayama Prefecture, Honshu, Japan.[14]

[11] Mining World and Engineering Record, vol. 160, No. 4162, Jan. 6, 1951, pp. 2–3.
[12] Engineering and Mining Journal, vol. 151, No. 8, August 1950, p. 172.
[13] Engineering and Mining Journal, vol. 150, No. 7, July 1949, p. 202.
[14] Mining World, Major Ore Bodies Found at Japanese Pyrite Mine: Vol. 13, No. 1, January 1951, p. 27.

Norway.—Norway maintained pyrite production in 1950 at about the same level as in the previous 3 years, but considerably lower than prewar rates.

Philippines.—The proposed construction of a fertilizer plant in the Philippines has led to investigation of sulfur and pyrite reserves available for use in the project.

South Africa.—A 50- to 60-ton per day sulfuric acid plant was to be erected at the Rhokana smelter to supply acid for leaching of Nchanga oxide concentrates and for the plant of the Rhodesia Copper Refineries, Ltd.[15]

[15] Mining Journal (London), vol. 234, No. 5974, Feb. 17, 1950, p. 156.

Talc and Pyrophyllite

By Bertrand L. Johnson and F. M. Barsigian

GENERAL SUMMARY

MARKED increases occurred in 1950 in mine production of talc, pyrophyllite, and ground soapstone, as well as in the quantity and value of these commodities sold or used (*see* fig. 1). Total imports were also much higher, both in quantity and value, in 1950 than in 1949. Exports of crude and ground talc, steatite, soapstone, and pyrophyllite were also considerably greater in quantity and value. Exports of talcum powders again decreased sharply in total value, declining from $1,636,505 in 1949 to $1,234,318 in 1950.

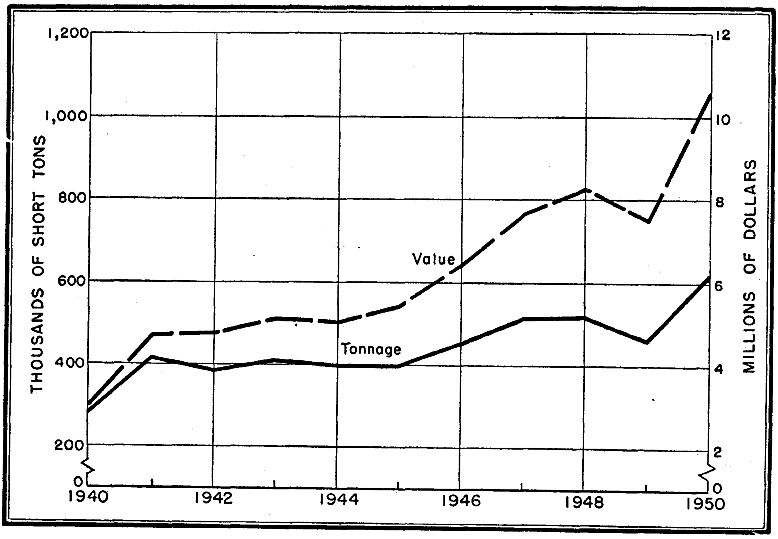

FIGURE 1.—Sales of domestic talc, pyrophyllite, and ground soapstone, 1940–50.

TABLE 1.—Salient statistics of the talc, pyrophyllite, and ground-soapstone industries in the United States, 1949–50

	1949		1950	
	Short tons	Value	Short tons	Value
Mined	459,345	(1)	616,680	(1)
Used by producers	415,575	(1)	564,067	(1)
Sold by producers:				
Crude	49,706	$435,571	58,136	$517,941
Sawed and manufactured	636	253,704	805	312,776
Ground [2]	411,554	6,834,203	561,809	9,790,026
Total sales	461,896	7,523,478	620,750	10,620,743
Imports for consumption: [3]				
Crude and unground	[4] 47	[4] 4,981	177	10,052
Cut and sawed	[4] 121	[4] 35,072	156	44,364
Ground, washed, or pulverized	18,648	537,061	23,054	637,262
Total imports	18,816	577,114	23,387	691,678
Exports:				
Talc, steatite, soapstone, and pyrophyllite, crude and ground [5]	15,841	440,141	20,644	586,244
Powders—talcum (in packages), face, and compact	(1)	[4] 1,636,505	(1)	1,234,318
Total exports		[4] 2,076,646		1,820,562

[1] Figure not available.
[2] Includes some crushed material.
[3] Exclusive of "Manufactures, n. s. p. f. (not specially provided for), except toilet preparations," as follows: 1949: $9,012; 1950: $7,574. Quantities not available.
[4] Revised figure.
[5] Includes manufactures, n. e. s.

A number of articles on talc and pyrophyllite have appeared recently.[1]

[1] Burgess, B. C., Pyrophyllite; Industrial Minerals and Rocks: Am. Inst. Min. and Met. Eng., 2d ed. 1949, pp. 756–765.
Engel, A. E. J., Talc and Ground Soapstone; Industrial Minerals and Rocks: Am. Inst. Min. and Met. Eng., 2d ed. 1949, pp. 1018–1041.
Reed, A. H., Jr., Investigation of the Winterboro Talc Deposits, Talladega County, Ala.: Bureau of Mines Rept. of Investigations 4661, 1950, 7 pp.
Ceramic Industry, Binders for Dry-Pressing Steatite: Vol. 53, No. 1, 1949, p. 78.
Trauffer, W. E., New Fine-Grinding Method: Pit and Quarry, vol. 43, No. 2, August 1950, pp. 58–62, 64. (Describes new plant of Gouverneur Talc Co., Gouverneur, N. Y.
Thurnauer, Hans, High-Frequency Insulation: Am. Ceram. Soc. Bull., vol 29, No. 4, April 1950, pp. 158–160.
Lamb, F. D., and Ruppert, John, Flotation of a North Carolina Pyrophyllite Ore: Bureau of Mines Rept. of Investigations 4674, 1950, 7 pp.
The Mineralogist, Polishing Peanuts: Vol. 18, No. 3, March 1950, p. 168. 1 paragraph.
Dolbear, Samuel, and others, Economic Mineral Resources and Production of California: California State Div. of Mines Bull. 130, 1950.
Lomas, J., Talc: Mine and Quarry Eng., vol. 16, No. 8, August 1950, pp. 259–261.
Johns, R. H., and Lance, J. F., Geology of the San Diequito Pyrophyllite Area, San Diego County, Calif.: California Dept. Nat. Res., Div. Mines, Special Rept. 4, November 1950, 32 pp.
Van Horn, E. C., Talc Deposits of the Murphy Marble Belt: North Carolina Dept. Conservation and Development, Div. Mineral Resources, Bull. 56, 1948, 54 pp.
Billings, M. P., and Chidester, A. H., Maps of Waterbury Talc Mine, Moretown, Vt.: Geol. Survey, Strategic Minerals Investigations, Preliminary Maps 3–225, 1948. Maps of Mad River Mine, Rousseau Prospect, and Carleton Quarry, Vermont: Geol. Survey, Strategic Minerals Investigations, Preliminary Maps 3–227, 1950.
Gillingham, W. P., Grinding Talc to Superfine Size: Compressed Air Mag., vol. 55, No. 2, February 1950, pp. 32–37.
Kauffman, A. J., Jr., and Dilling, E. D., Differential Thermal Curves of Certain Hydrous and Anhydrous Minerals, with a description of the apparatus used: Econ. Geol., vol. 45, No. 3, May 1950, pp. 222–224

PRODUCTION AND SALES

The 620,750 short tons of domestic talc, pyrophyllite, and ground soapstone sold or used in 1950, valued at $10,620,743, constituted a record high, which greatly exceeded the previous high attained in 1948.

TABLE 2.—Talc, pyrophyllite,[1] and ground soapstone sold by producers in the United States, 1946–50, by classes

Year	Crude[1]			Sawed and manufactured		
	Short tons	Value at shipping point		Short tons	Value at shipping point	
		Total	Average		Total	Average
1946	36,963	$348,484	$9.43	756	$227,751	$301.26
1947	47,925	389,535	8.13	1,018	239,407	235.17
1948	49,124	408,186	8.31	920	227,963	247.79
1949	49,706	435,571	8.76	636	253,704	398.91
1950	58,136	517,941	8.91	805	312,776	388.54

Year	Ground			Total		
	Short tons	Value at shipping point		Short tons	Value at shipping point	
		Total	Average		Total	Average
1946	419,347	$5,869,109	$14.00	457,066	$6,445,344	$14.10
1947	467,151	7,053,539	15.10	516,094	7,682,481	14.89
1948	468,702	7,629,214	16.28	518,746	8,265,363	15.93
1949	[2] 411,554	[2] 6,834,203	[2] 16.61	461,896	7,523,478	16.29
1950	[2] 561,809	[2] 9,790,026	[2] 17.43	620,750	10,620,743	17.11

[1] Includes pinite, although there were no sales of this material in 1946 and 1949–50.
[2] Includes some crushed material.

TABLE 3.—Pyrophyllite[1] produced and sold by producers in the United States, 1946–50

Year	Production (short tons)	Sales					
		Crude		Ground		Total	
		Short tons	Value	Short tons	Value	Short tons	Value
1946	97,765	10,716	$85,002	85,835	$913,301	96,551	$998,303
1947	108,450	6,204	27,626	97,536	1,135,100	103,740	1,162,726
1948	107,885	5,175	25,766	102,152	1,313,266	107,327	1,339,032
1949	90,920	5,927	31,489	82,934	1,070,838	88,861	1,102,327
1950	116,800	5,690	30,016	112,119	1,504,141	117,809	1,534,157

[1] Exclusive of pinite.

REVIEW BY STATES

In 1950, the talc alone produced in New York still exceeded, by a large margin, the combined talc, pyrophyllite and ground soapstone produced in any other State. For the three materials combined, North Carolina was second, and California third, as in 1949. Sales in all the listed States except Nevada were higher in 1950 than in 1949. Sales of pyrophyllite, most of which comes from North Carolina, increased in 1950 over 1949.

TABLE 4.—Talc, pyrophyllite, and ground soapstone, sold by producers in the United States, 1948–50, by States

State	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
California	98,681	$1,773,764	83,359	$1,434,046	109,747	$2,069,211
Georgia	53,602	624,694	49,338	580,405	70,749	774,148
Maryland and Virginia	40,276	341,875	32,256	268,423	41,206	355,075
Nevada [1]	8,019	107,730	8,837	147,148	8,581	170,736
New York	119,716	2,613,935	115,636	2,658,774	163,974	4,039,973
North Carolina	104,052	1,455,691	86,208	1,344,767	116,895	1,855,163
Vermont	70,922	1,014,718	64,508	788,341	72,135	906,396
Other States [2]	23,478	332,956	21,754	301,574	37,463	450,041
Total	518,746	8,265,363	461,896	7,523,478	620,750	10,620,743

[1] Includes pinite; no sales in 1949–50.
[2] Montana, Texas, and Washington.

CONSUMPTION AND USES

Sales to six industries—ceramics, paint, rubber, insecticides, roofing, and paper—accounted for 85 percent of the total sales of domestically produced talc, pyrophyllite, and ground soapstone in 1950, according to reports from the producers. Increases over 1949 occurred in all consuming industries itemized. The ceramics and paint industries continued to contend for the position of leading consumer and the data available indicate that the former industry was slightly in advance in 1950.

TABLE 5.—Talc, pyrophyllite, and ground soapstone sold by producers in the United States, 1948–50, by uses [1]

Use	1948		1949		1950	
	Short tons	Percent of total	Short tons	Percent of total	Short tons	Percent of total
Paint	108,500	21	100,100	22	145,000	23
Ceramics	108,000	21	94,700	20	148,500	24
Rubber	66,200	13	53,400	12	75,900	12
Insecticides	72,700	14	[2] 61,100	13	77,000	12
Roofing	55,000	11	44,200	10	55,400	9
Paper	32,400	6	25,300	5	29,600	5
Toilet preparations	7,400	1	8,400	2	11,700	2
Foundry facings	6,800	1	[2] 5,300	1	7,800	1
Crayons	400	(3)	560	(3)	600	(3)
Other uses [4]	38,000	7	47,300	10	48,000	8
Unclassified	[2] 23,346	5	[2] 21,536	5	21,250	4
Total	518,746	100	461,896	100	620,750	100

[1] Partly estimated.
[2] Revised figure.
[3] Less than 0.5 percent.
[4] Refractory, textile, asphalt filler, plaster, and miscellaneous other uses.

PRICES

The average value per ton of domestic talc, pyrophyllite, and ground soapstone sold (or used by producers) rose from $16.29 in 1949 to $17.11 in 1950, an increase of 82 cents a ton.

Prices of ground talc and pyrophyllite, quoted by the Oil, Paint and Drug Reporter for the first weeks of 1949, 1950, and 1951, are shown in the following table.

TABLE 6.—Prices quoted on talc and pyrophyllite, car lots, 1949–51, per short ton
[Oil, Paint and Drug Reporter]

Mineral and grade	Jan. 3, 1949	Jan. 1, 1950	Jan. 8, 1951
GROUND TALC (BAGGED)			
Domestic, f. o. b. works:			
Ordinary:			
California	$22.00–$30.00	$25.00–$35.00	$25.00–$35.00
New York	21.00	(1)	(1)
Vermont	14.00	14.00	14.00
Fibrous (New York):			
Off color	24.00	24.00	24.00
325-mesh:			
88.95–99.95 percent	21.00	(1)	(1)
98–99.5 percent	23.00–28.00	(1)	(1)
98.5–99.5 percent	(1)	23.00–28.00	25.00
Imported (Canadian)	35.00–45.00	12.50–35.00	12.50–35.00
PYROPHYLLITE (BULK AT MINES)			
Standard: [2]			
200-mesh	11.00–11.50	11.00–11.50	11.00–11.50
230-mesh	12.00	12.00	12.00–12.50
325-mesh	14.00	15.00	15.75
No. 3: 200-mesh	9.50	9.50	9.50
Insecticide grade: 200-mesh [2]	9.00–10.00	12.00–12.50	12.00–12.50
Rubber grade: 140-mesh	7.00	10.00–10.50	10.00–10.50

[1] Not quoted.
[2] In paper bags, $3 to $3.50 per ton extra.

FOREIGN TRADE [2]

Imports.—Total unmanufactured talc, steatite, or soapstone, and French chalk imported for consumption in the United States registered marked increases in 1950 over 1949 in both quantity and value. An increase of 4,571 short tons, or $114,564, resulted in the highest quantity since 1940 and a new record for value of the material imported. Imports of "manufactures," however, which are exclusive of toilet preparations, continued the decline in value evident in recent years.

The greater part of the unmanufactured imports remained the "ground, washed, powdered or pulverized, except toilet preparations" material. Most of the ground material came from Italy, with Canada in second place, and France, third. The manufactures came chiefly from China.

[2] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 7.—Talc, steatite or soapstone, and French chalk imported for consumption in the United States, by classes in 1946–48, and by classes and countries in 1949–50

[U. S. Department of Commerce]

Country	Crude and unground		Ground, washed, powdered or, pulverized, except toilet preparations		Cut and sawed		Total unmanufactured		Manufactures n. s. p. f. except toilet preparations (value)
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	
1946	8	$530	18,407	$394,881	34	$4,856	18,449	$400,267	$15,687
1947	48	1,962	17,629	414,726	27	8,235	17,704	424,923	13,525
1948	85	4,835	18,194	484,857	98	29,133	18,377	518,825	14,772
1949									
Canada			4,166	51,150	13	1,885	4,179	53,035	
China									8,697
Egypt	4	333					4	333	
France			1,189	25,126	5	1,260	1,194	26,386	
Germany									6
Hong Kong									251
India	43	4,648	56	2,154			99	6,802	
Italy			13,237	458,629	[1] 93	[1] 29,094	13,330	487,723	58
Norway					10	2,833	10	2,833	
Sweden			(2)	2			(2)	2	
Total	[1] 47	[1] 4,981	18,648	537,061	[1] 121	[1] 35,072	18,816	577,114	9,012
1950									
Afghanistan	84	3,000					84	3,000	
Canada			4,135	48,998	5	971	4,140	49,969	
China	(2)	35					(2)	35	6,786
Egypt	14	296					14	296	
France			2,149	34,343	7	1,272	2,156	35,615	474
Hong Kong									4
India	79	6,721	168	5,337			247	12,058	5
Italy			16,602	548,584	122	35,575	16,724	584,159	
Japan									114
Norway					22	6,546	22	6,546	
United Kingdom									191
Total	177	10,052	23,054	637,262	156	44,364	23,387	691,678	7,574

[1] Revised figure.
[2] Less than 0.5 ton.

Exports.—The quantity of "talc, steatite, soapstone, and pyrophyllite, crude and ground" exported from the United States in 1950 rose 4,753 short tons above the exports of 1949 to a total of 20,593 tons—a new record, surpassing the previous high of 1947 by about 3,000 tons. The value of these exports—$560,752—was also a new record. The value of the exports of "powders—talcum (in packages), face and compact" continued the decline of recent years and reached the lowest point since 1943, when the value of the exports was only $756,024.

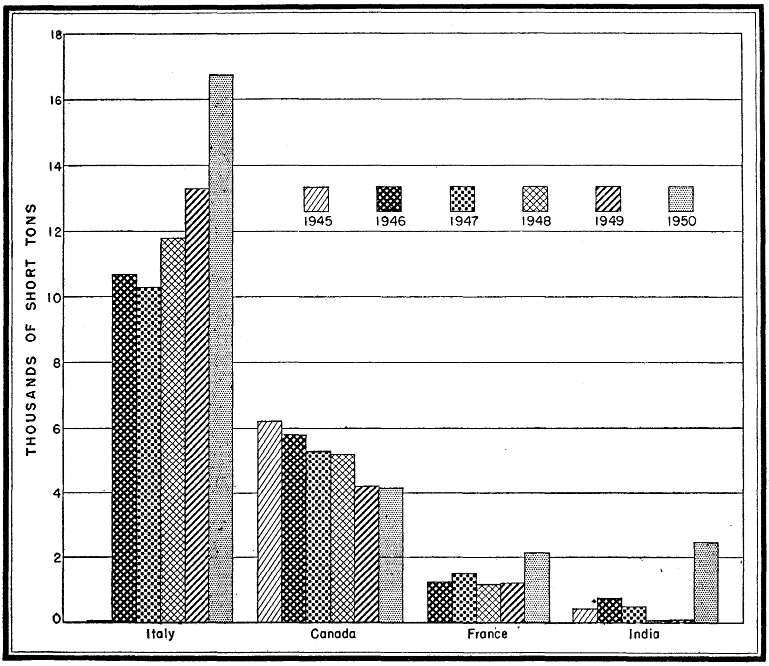

FIGURE 2.—Unmanufactured talc, steatite or soapstone, and French chalk imported for consumption in the United States, 1945–50, by principal countries.

TABLE 8.—Talc, pyrophyllite, and talcum powders exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Talc, steatite, soapstone, and pyrophyllite				Powders—talcum (in packages), face and compact (value)
	Crude and ground		Manufactures, n. e. s.		
	Short tons	Value	Short tons	Value	
1946	16,373	$394,799	(1)	(1)	$3,517,827
1947	[2] 17,557	[2] 429,803	(1)	(1)	4,252,161
1948	16,327	432,176	(1)	(1)	2,228,956
1949	15,840	439,686	1	$455	[3] 1,636,505
1950	20,593	560,752	51	25,492	1,234,318

[1] Not separately classified before January 1949.
[2] Excludes 599 short tons, valued at $30,589, sent to Japan under the Army Civilian Supply Program.
[3] Revised figure.

WORLD REVIEW

The production of talc, pyrophyllite, and ground soapstone in recent years in various countries is shown in the accompanying table.

TABLE 9.—World production of talc, pyrophyllite, and soapstone,[1] 1943–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1943	1944	1945	1946	1947	1948	1949	1950
Argentina	3,557	3,421	2,681	3,760	(2)	(2)	(2)	(2)
Australia	5,410	6,074	4,968	5,838	5,929	6,198	8,717	[3] 7,000
Austria	57,639	44,628	4,470	21,600	24,500	47,300	52,144	53,625
Brazil	1,934	4,966	2,708	4,183	9,500	10,743	7,221	(2)
Canada	23,735	29,571	24,574	26,628	24,230	26,109	24,423	24,675
Newfoundland	2,439	224	711	660	220	---		
Chile	276	935	477	640	1,085	270	110	(2)
Egypt	2,054	4,265	3,868	4,760	4,630	5,521	5,573	3,731
Finland	(2)	(2)	75	300	(2)	237	(2)	4,000
France	48,300	26,720	40,650	63,350	69,785	91,520	99,650	95,500
Germany: Federal Republic	(2)	(2)	6,300	13,800	[4] 20,484	[5] 28,214	30,968	(2)
Greece	---	---	---	500	200	1,800	1,700	2,500
India	16,700	21,735	22,872	96,220	20,823	18,291	21,535	(2)
Indochina	360	532	---	---	---	---	---	(2)
Italy	75,781	38,019	39,861	36,356	50,260	70,139	60,210	66,737
Japan	331,581	306,563	199,653	111,562	183,129	243,737	262,433	283,566
Kenya	63	123	202	490	297	322	590	334
Korea:								
North	[6] 35,370	1,200	[6] 12,152	(2)	(2)	(2)	(2)	(2)
South		40,011		300	700	72	2,773	(2)
Madagascar	39	(7)	---	---	---	---	(2)	(2)
New Zealand	63	25	---	---	---	---	---	(2)
Norway	35,514	[6] 21,559	15,522	31,062	37,687	60,226	[3] [8] 40,900	55,000
Rumania	1,609	(2)	(2)	267	(2)	(2)	(2)	(2)
Spain [9]	14,238	10,470	19,319	30,665	31,616	29,984	38,208	25,131
Sweden	5,335	5,512	9,360	14,010	10,710	11,703	11,293	(2)
Union of South Africa	5,344	2,875	1,947	3,680	2,700	4,897	5,386	3,978
United Kingdom	2,815	2,829	2,170	3,437	3,379	(2)	2,616	(2)
United States [10]	374,546	361,841	361,406	414,641	468,190	470,596	419,023	563,132
Uruguay	1,985	2,257	1,823	1,818	2,675	2,984	660	681
Total (estimate) [1]	1,120,000	1,010,000	840,000	950,000	1,040,000	1,200,000	1,170,000	1,330,000

[1] In addition to countries listed, talc or pyrophyllite is reported in Afghanistan, Bulgaria, China, Pakistan, Portugal, and U. S. S. R., but data on production are not available; estimates have been included in total.
[2] Data not available; estimate by author of chapter included in total.
[3] Estimate.
[4] American zone only.
[5] Bizonal area.
[6] Incomplete.
[7] Less than 1 ton.
[8] Exports.
[9] Includes steatite as follows: 1943: 9,741; 1944: 7,369; 1945: 15,577; 1946: 19,541; 1947: 20,835; 1948: 18,627; 1949: 20,880; 1950: 13,702.
[10] Talc, pyrophyllite, pinite, and ground soapstone sold by producers. (No pinite sold by producers in either 1949 or 1950.)

Canada.—Preliminary reports show that in 1950 Canada produced 27,200 short tons of talc and soapstone valued at $344,000, slightly larger both in quantity and value than in 1949.[3]

The Canadian talc and soapstone industry in 1949 was described in an official report as follows:[4]

Shipments of talc and soapstone by Canadian producers during 1949 amounted to 26,922 tons valued at $320,793 compared with 28,780 tons worth $309,823 in 1948. Ontario's production of 13,600 tons was mostly high-grade milled talc. Shipments from Quebec deposits included crayons, blocks and ground soapstone.

The industry employed 59 persons and distributed $105,736 in wages and salaries. Fuel cost $2,926 and electricity amounting to 1,567,092 k. w. h. cost $18,900.

[3] Canada, Dominion Bureau of Statistics, Preliminary Estimate of Canada's Mineral Production, 1950: Prepared in Mining, Metallurgical, and Chemical Section, Industry and Merchandising Division, Dominion Bureau of Statistics, Ottawa, Canada, Dec. 29, 1950, 4 pp.
[4] Canada, Department of Trade and Commerce, Dominion Bureau of Statistics, The Talc and Soapstone Industry, 1949: Industry and Merchandising Division, Mining, Metallurgical and Chemical Section, Ottawa, Canada, 1950, 3 pp.

Imports of talc and soapstone totalled 7,269 tons valued at $228,408. Exports of talc in 1949 amounted to 4,222 tons valued at $54,515.

Ground talc, including soapstone and pyrophyllite, is used chiefly in the paint, roofing, paper, rubber, insecticide, and ceramic industries. It is used also in foundry facings, bleaching fillers for textiles, cosmetics and pharmaceuticals, soaps, and cleansers, plaster, polishes, plastics, and for rice polishing. Soapstone is used extensively in the form of sawn blocks and bricks for lining the alkali recovery furnaces and kilns of kraft pulp and paper mills. It is used for brick and slab liners for fireboxes, stoves, and ovens, and for switchboard panels, laboratory benches, etc. Considerable quantities of soapstone quarry and sawing waste are ground and used as low-grade talc in the rubber, roofing, foundry, and other trades. Compact, massive talc, sawn into square pencils and slices, is an important material for steelmakers' crayons.

Consumption of ground talc and soapstone in Canada, by uses and Provinces, 1946–48, in short tons

	1946	1947	1948
USES			
Roofing	8,065	8,618	7,696
Paints	5,445	7,352	6,041
Rubber	2,529	3,075	3,125
Insecticides	2,616	2,388	2,461
Pulp and paper	2,872	1,899	3,722
Toilet and medicinal preparations	1,226	1,350	1,242
Imported clay products	1,107	1,214	1,127
Soaps and cleaning preparations	683	524	310
Electrical apparatus	259	330	658
Textiles	250	[1] 150	[1] 150
Iron foundries	106	[1] 106	[1] 106
Prepared foundry facings	17	39	70
Polishes	31	8	14
Adhesives	45	[1] 6	4
Linoleum	19	6	6
Plastics			
Total	25,270	[2] 27,115	[2] 26,782
PROVINCES			
Alberta	83	70	96
British Columbia	648	678	487
Manitoba	1,548	1,503	1,493
New Brunswick	375	509	292
Nova Scotia	52	60	56
Ontario	13,285	14,208	15,911
Quebec	9,204	10,006	8,334
Saskatchewan	75	81	113
Total	25,270	27,115	26,782

[1] Partly estimated.
[2] Includes 50 tons unclassified by type of use.

Tin

By Abbott Renick and John B. Umhau

GENERAL SUMMARY

WORLD mine production of tin totaled 166,400 long tons in 1950—the highest since 1941—and was 4,600 tons (3 percent) greater than in 1949. Most of the gain over 1949 was in Malaya, Thailand, and Indonesia, where output expanded 5, 33, and 11 percent, respectively. World smelter production increased 4,300 tons (3 percent), principally because of increases of 10 and 9 percent, respectively, in the outputs in Malaya and the Netherlands. United States mine output remained negligible.

The International Tin Study Group held its fifth meeting in Paris during March, to continue its investigation of means for stabilizing the tin industry. The group requested the Secretary General of the United Nations to call a conference to discuss a commodity-control agreement. The United Nations Tin conference, attended by delegations from 20 countries, was held as a result in Geneva from October 25, 1950, to November 21, 1950. The Paris Draft Agreement, which relied essentially on production limitations and a buffer stock to stabilize the industry, was among the proposals considered. However, the conference did not develop an acceptable agreement from any of the various proposals submitted and adjourned subject to being reconvened by the Secretary General.

On September 8, 1950, the President signed the Defense Production Act, which provided, among other purposes, for the encouragement of exploration, development, and mining of critical and strategic minerals and metals, the expediting of production, and the allocation of scarce and critical metals. The Defense Minerals Administration was established in the United States Department of the Interior, to carry out the mineral production expansion provisions of the act, and tin was one of the commodities given a high priority rating in this connection.

Legislation was passed extending the authority to operate the Government-owned tin smelter (Longhorn smelter) at Texas City, Tex., for 5 years, until June 30, 1956. Ore purchase contracts were concluded with Bolivia, Indonesia, and Belgian Congo. The Reconstruction Finance Corporation and the Bolivian producers extended the 1950 contract late in December for 2 months. On November 13, 1950, the National Production Authority issued Tin-Control Order M–8. Under this order, tin inventories were limited to a 60-day supply, and all important consumers of tin were required to report their stocks and consumption. On December 18 the order was amended to limit all consumers in January 1951 to 100 percent of their average consumption during the first 6 months of 1950 (base period); this was to be cut to 80 percent during February and March.

Consumption of tin in 1950 in the United States increased 44 percent over 1949; primary tin increased 51 percent and secondary tin 32 percent. Domestic smelter output, nearly all from the Government-owned smelter at Texas City, decreased 3,917 long tons (11 percent) from 1949. Secondary tin production increased 43 percent.

Metal imports increased 38 percent and exceeded the tin content of concentrates by 219 percent. Receipts of concentrates, in terms of metal, were 32 percent lower than in 1949. The decrease was chiefly due to smaller receipts from Indonesia and Bolivia. Imports of tin in concentrates from Belgian Congo increased.

The total stocks of tin in the United States and in transit as of December 31, were 72,651 long tons, exclusive of the National strategic stockpile. As a reserve for civilian deficiency, the Reconstruction Finance Corporation on December 31, 1950, held 18,618 long tons of tin metal; 3,168 were of foreign origin, and 15,450 were produced at the Texas City smelter. In addition to the reserve stocks of tin metal, the RFC held 939 long tons of Copan metal. On December 31, tin concentrate and tin-bearing material held by the RFC, including ore stored abroad or in transit to the smelter from foreign sources, ore stored at the smelter, material in active process and inactive inventories, had a total estimated tin content of 20,674 long tons. As of December 31, tin stocks held by industry and in transit to consuming plants were 33,359 long tons.

Domestic price movements for grade A tin during the first 6 months of 1950 were orderly and averaged 76.277 cents, whereas during the final 6 months prices became chaotic, averaging $1.148. The annual average for 1950 was 95.557 cents.

Major progress was made during the year in accumulations for the National Strategic Stockpile.

TABLE 1.—Salient statistics of tin in the United States, 1941–45 (average) and 1946–50

	1941–1945 (average)	1946	1947	1948	1949	1950
Production—						
From domestic mines.......long tons..	14.7	....	1.3	4.7	68.4	94.1
From domestic smelters [1].......do....	22,171	43,500	33,300	36,703	35,834	33,118
From secondary sources........do....	33,140	24,700	26,800	26,900	22,230	31,680
Imports for consumption:						
Metal..........................do....	40,275	15,559	24,899	49,196	60,224	82,837
Ore (tin content)..............do....	29,697	38,070	29,410	37,492	38,311	25,960
Exports (domestic and foreign)......do....	1,000	881	420	91	154	799
Monthly price of Straits tin at New York:						
Highest.............cents per pound..	52.27	70.00	94.00	103.00	103.00	163.50
Lowest.........................do....	51.63	52.00	70.00	94.00	77.50	74.125
Average........................do....	52.00	54.58	77.94	99.25	99.316	95.557
World mine production.........long tons..	138,760	88,000	114,500	152,500	161,800	166,400

[1] Including tin content of ores used direct to make alloys.

GOVERNMENT CONTROLS

Tin was under Government allocation control from December 17, 1941 (M-43), until December 1, 1949, when the control regulations were reduced to a reporting basis until June 30, 1950, when Public Law 153 expired. During 1950 tin and manufactures, including tin plate, continued on the positive list and required an export license for shipment to any destination abroad except Canada.

Following approval of the Defense Production Act of 1950 on September 8, the National Production Authority was established on September 11. Inventory Control Regulation 1, September 18, 1950, was the first to be issued by NPA. It limited to a "practicable minimum working inventory" the quantities of various materials in short supply, including primary and secondary tin and all tin and tin-base alloy scrap containing commercially recoverable tin. The announced purpose of the order was to make clear that national interest demanded that there be no accumulation beyond what was needed for immediate production. Under NPA Order M-8, November 13, 1950, tin was again placed under control. Tin reporting was made mandatory, and inventories of alloys or other materials containing tin, excluding ores and concentrates, were limited to 60 days' supply or a practicable minimum working inventory (as defined in NPA Regulation 1) whichever was less. On December 18, 1950, an amendment to Order M-8 limited the consumption of pig tin to 100 percent of the monthly average usage during the first half of 1950 and applicable to January 1951 tonnages. Use was to be cut to 80 percent in February and March. Defense orders were excepted, and allowance made for undue or exceptional hardship.

Under NPA Delegation 5, December 18, 1950, the Secretary of the Interior was made claimant for certain production facilities for minerals and metals and was given specified powers to control the distribution of metals and minerals through the processes of smelting and refining. The delegation included tin ores and concentrates as related to mines, mills, and primary and secondary smelters and refineries. NPA Notice 1, December 27, 1950, and Defense Minerals Administration Order MO-1, December 29, 1950, designating scarce materials whose hoarding was prohibited, included tin, all alloys containing tin, tin chemicals, tin products, tin-base alloys, tin ores and concentrates.

Tin pricing was freed to the open market after announcement of the withdrawal by the Reconstruction Finance Corporation on March 13, 1950, of all fixed quotations for sale of its tin. Public Law 723, Eighty-first Congress, second session, approved August 21, 1950, extended to June 30, 1956, the authority of the RFC to improve, develop, maintain, and operate by lease or otherwise the Government-owned tin smelter at Texas City, Tex., and to finance research in tin smelting and processing.

DOMESTIC PRODUCTION

MINE OUTPUT

Domestic mine production of tin in concentrates was 94.1 long tons in 1950 compared with 68.4 tons in 1949. Most of the output was derived from placer deposits in Alaska. With an output of about 79 long tons of concentrates containing about 41 long tons of tin, the largest producer was the United States Tin Corp., operating its placer on Lost River, Port Clarence district, Seward Peninsula region, Alaska. The second largest producer, the Northern Tin Co., operated on Buck Creek, Port Clarence district, Seward Peninsula, Alaska. About 35,000 cubic yards of material was processed by the company, from which about 54 long tons of concentrate containing 37.3 long tons of tin (69.6 percent) was recovered and shipped. At Climax, Colo. the Climax Molybdenum Corp. recovered a very small tonnage of tin as a byproduct of mining for molybdenum. Assay has shown only a trace of tin in the crude ore mined by the company.

In 1944 the Bureau of Mines in cooperation with the Geological Survey investigated the Hogan tin mine, Kern County, Calif. by trenching and diamond drilling 11 holes, totaling 1,000 feet.[1] During the decade 1939–49 under the Bureau of Mines strategic minerals development program, "Examinations have been made of 85 tin occurrences; projects have been run on 12 deposits, 7 of which indicated some tonnage with sufficient tin content that it could conceivably be recovered. The total indicated tin content of these deposits is insignificant in terms of national requirements." [2] As part of the Bureau of Mines activities a report was issued [3] presenting the factual data disclosed by sampling pegmatites containing cassiterite at the Coosa tin deposit, Coosa County, Ala. The results of beneficiation tests on samples of the pegmatites were reviewed.[3]

TABLE 2.—Mine production of tin (content) in the United States, 1941–45 (average) and 1946–50 by States, in long tons

Year	Alaska	South Dakota	Colorado	Other States	Total	
					Long tons	Value
1941–45 (average)	9.9	1.2		3.7	14.8	$17,180
1946						
1947	1.3				1.3	2,200
1948	[1] 4.7	(1)			4.7	10,380
1949	51.6		16.8		68.4	152,210
1950	79.5		14.6		94.1	201,446

[1] A very small quantity from South Dakota is included with Alaska.

SMELTER OUTPUT

Smelters in the United States produced 33,118 long tons of tin in 1950 compared with 35,834 tons in 1949. Output was essentially

[1] Bedford, Robert H., and Ricker, Spangler, Investigation of the Hogan Tin Mine, Kern County, Calif.: Bureau of Mines Rept. of Investigations 4609, 1949, 10 pp.

[2] Moon, Lowell B., Bureau of Mines Strategic Minerals Development Program-Summary of Progress, 1939–49: Bureau of Mines Rept. of Investigations 4647, 1950, pp. 19 and 30.

[3] Reed, H. A., Jr., Coosa Tin Deposits, Coosa County, Ala.: Bureau of Mines Rept. of Investigations 4704, 1950, 33 pp.

that of the Government-owned smelter at Texas City. This smelter (Longhorn smelter) produced 32,136 long tons (including 44 secondary from drosses) in 1950 and 36,053 (including 238 of secondary from drosses) in 1949. In addition, beginning in January 1950, a new alloy—"Copan"—was produced. The total output of Copan in 1950 was 940 long tons, including 743 from concentrates and 197 from "remelts" (conversion from other grade). (Copan to Copan "remelts" not counted above amounted to 152 tons.) The Vulcan Detinning Co. recovered tin from low-grade concentrates during 1950. The company annual report for 1950 contained the following statement:

The new plant for the production of tin from low grade tin concentrates, placed in operation in November, 1949, was run intermittently during the year 1950. Continuous operation was not possible for two reasons; first, the necessity for making some changes in and adjustments to equipment; and, second, because of inadequate receipts of concentrates.

Various technical difficulties arose, all of which are believed to be susceptible to elimination by our engineering staff, but efforts to this end have been hampered and evaluation of costs has been made very difficult because of the interruptions in operations due to lack of raw material.

This development was based on the theory that a much larger portion of our Country's tin requirements could be obtained from Western Hemisphere sources if a process could be developed to treat impure concentrates with low tin content without the admixture of high grade, high tin content material. We believe the results show that the development of such a process has been substantially accomplished. However, world conditions have created so great a demand for tin-bearing materials, not only abroad but also for the Government smelter at Texas City, that it is not possible for us to obtain supplies either in sufficient quantity to permit operation on a continuous basis or at economic prices. Therefore, it is entirely possible that we may have to place our plant in stand-by condition until the situation changes. In the meanwhile, the technology we have developed will be available for the Country's needs if and when required.

The Longhorn smelter treated concentrates, mainly from Bolivia, Indonesia, Thailand, and the Belgian Congo, in 1950. Dressing-plant, low-grade, coarse rejects, accumulated for the most part before the end of 1947, continued to be treated by the smelter. At the close of 1947, there were on hand about 27,100 long dry tons of these rejects containing 5,385 long tons of tin. This inventory had been reduced to 5,460 tons containing 1,322 tons of tin by the end of 1950. Of these rejects, 7,313 long tons (1,463 tons of tin) was shipped to the Capper Pass smelter, Hull, England, for treatment and the return to this country of tin content in form of high-grade electrolytic tin. Inactive inventories of dressing plant slimes, amounting to about 12,025 long dry tons containing 2,844 tons of tin at the end of 1947, were increased slightly to 12,120 tons containing 2,855 tons of tin at the end of 1950. Of the latter tonnage, 6,707 tons containing 1,722 tons of tin, has been held in 6 ponds since before the end of 1947. A seventh pond with 5,413 tons, containing 1,133 tons of tin, had a slight increase in tonnage. No attempt will be made to treat these slimes until the waste acid plant is in regular operation and recovery of certain byproducts made possible.

Construction of the waste acid plant, which was begun in October 1948, was completed in April 1950. When placed in regular operation this plant is expected to treat the waste acid resulting from current smelter operations and to dispose gradually of approximately 100,000,000 gallons of waste acid stored in ponds adjacent to the smelter, with recovery of a commercial grade of hydrochloric acid. The latter can be used by the smelter or sold. In addition, the plant will recover, in the form of a cement, various metal byproducts of considerable value, notably silver. Trial operations encountered numerous difficulties, mostly mechanical. Efforts of the experimental department of Tin Processing Corp. during 1950 were devoted in large part to correction of difficulties encountered. Limited operations, however, resulted in production of commercial-grade hydrochloric acid and proved the efficiency of the process, although continual mechanical difficulties prevented full and continuous operation. The cost of this plant to the end of 1950 amounted to $3,120,676, with an expenditure of $821,983 during 1950.

Of the total tin produced at the Longhorn smelter in 1950, 81 percent was 3-Star grade; 17 percent 2-Star; 2 percent Copan alloy and 1-Star. The smelter upgraded and recast 4,965 tons (of which 3,318 were recast into 3-Star) of previously produced lower grades of tin. No. 1-Star was produced after January and No. 2-Star after August 1950. With improved plant equipment and new operating procedures, only grade A 3-Star and 345 tons of Copan were produced from September to December 1950. In 1949 the proportions of the various grades were 64 percent of 3-Star, 27 of 2-Star, 5 percent of 1-Star, and 4 percent of No-Star G, with no Copan. In 1949, 1,290 tons of grade G were remelted, further refined, and converted into 2-Star and 1-Star. The Longhorn smelter continued to be operated on a cost-plus-fixed-fee arrangement by Tin Processing Corp. (a Delaware corporation and a subsidiary of N. V. Billiton Maatschappij). The contract with the firm extends to June 30, 1951.

Under Public Law 148, Eighty-first Congress, first session, approved June 30, 1949, the RFC sold to the Vulcan Detinning Co. during 1950 approximately 500 long tons of low-grade Bolivian tin concentrates containing approximately 19 percent tin. The RFC also contracted to purchase the resulting metal from the company for the account of General Services Administration.

TABLE 3.—Longhorn tin-smelter production, by months, 1942–50, in long tons

Month	1942	1943	1944	1945	1946	1947	1948	1949 [1]	1950 [2]
January	--------	2,611	2,153	3,114	3,812	3,024	3,172	3,257	2,627
February	--------	2,334	2,419	3,162	3,823	2,815	2,800	3,254	2,362
March	--------	1,491	2,513	3,310	3,881	2,877	2,602	3,104	2,729
April	525	1,055	2,611	3,407	3,891	2,816	2,906	2,851	2,484
May	1,246	1,032	2,402	3,451	3,904	3,112	3,310	3,007	2,852
June	1,663	1,498	2,439	3,502	3,856	2,712	3,651	3,006	2,204
July	1,924	1,184	2,618	3,548	3,853	2,517	3,509	2,910	2,256
August	1,655	1,347	2,553	2,912	3,672	2,237	3,509	3,005	2,396
September	2,026	2,029	2,501	3,323	3,323	2,356	2,859	2,910	2,805
October	2,014	2,089	2,651	3,558	3,125	3,026	2,300	2,964	3,209
November	2,300	2,020	2,852	3,628	3,119	2,759	2,907	2,994	3,207
December	2,343	2,037	2,907	3,676	3,209	3,041	3,153	2,791	3,005
Total	15,696	20,727	30,619	40,591	43,468	33,292	36,678	36,053	32,136

[1] Includes 238 tons of secondary from drosses.
[2] Includes 44 tons of secondary from drosses, but excludes tin content of ores (621 long tons) used direct to make alloys. Also exclusive of tin recovered from remelts.

Longhorn smelter operating costs before depreciation, metal loss and byproduct credits were $5,667,028 for 1950. Operating costs for the last 6 months were slightly higher than for the previous 6 months due to pay increases and higher cost of supplies, but unit operating costs were lower as a higher grade of ore was treated. RFC assets of property, plant, and equipment under the tin program were valued at $10,046,364 as of June 30, 1949, and had increased to $11,631,015 by June 30, 1950.

SECONDARY TIN

Secondary tin recovered from all sources totaled 31,680 long tons in 1950, an increase of 43 percent over 1949. The value was 37 percent greater than in 1949. Detinning plants, operating at a record-breaking rate, supplied 13 percent of the total recovered during the year but had ample capacity for treating a larger tonnage had more tin-plate clippings and old cans been available.

Detinning plants accounted for most of the recovery of tin as metal. In total, they recovered 3,875 long tons of tin as metal and in chemicals in 1950 from tin-plate clippings and old cans, of which 3,300 were reclaimed in the form of pigs and 575 tons in the form of tin compounds. The industry reported treating 469,417 long tons of tin-plate clippings in 1950—the largest tonnage on record and nearly 21 percent above the previous peak in 1949. The average quantity of tin recovered per long ton of clean tin-plate scrap in 1950 was 17.98 pounds, compared to 18.29 pounds in 1949. Before electrolytic tin plate was introduced, recoveries averaged about 37 pounds per ton of material detinned. Lower recoveries per unit reflect treatment of a larger tonnage of electrolytic tin plate, which carries a much thinner coating than hot-dipped tin plate. For additional data concerning the secondary tin industry, see Secondary Metals, Nonferrous, chapter of this volume.

TABLE 4.—Secondary tin recovered in the United States, 1941–45 (average) and 1946–50, in long tons

Year	Tin recovered at detinning plants			Tin recovered from all sources			
	As metal	In chemicals	Total	As metal	In alloys and chemicals	Total: Long tons	Total: Value
1941–45 (average)	3,920	412	4,332	4,460	28,680	33,140	$38,584,220
1946	2,480	330	2,810	2,600	22,100	24,700	30,205,663
1947	2,720	360	3,080	2,900	23,900	26,800	46,848,175
1948	2,930	340	3,270	3,100	23,800	26,900	59,796,140
1949	2,850	410	3,260	3,170	19,060	22,230	49,461,354
1950	3,300	575	3,875	3,615	28,065	31,680	67,809,158

CONSUMPTION

APPARENT CONSUMPTION

Apparent consumption derived by adding net imports of pig tin to domestic smelter production increased 20 percent in 1950 over 1949. As changes in consumer, dealer, and Government stocks are not taken into account, apparent consumption may vary greatly from actual consumption as measured in finished products. In 1949 it considerably exceeded actual consumption, chiefly as a result of Government stockpiling. Table 5 gives the data for 1941–45 (annual average) and 1946–50. A comparable series for 1910–38 was published in Minerals Yearbook, 1939 (p. 680), and for 1939–48 in Minerals Yearbook, 1948 (p. 1212).

TABLE 5.—Apparent consumption of primary tin,[1] 1941–45 (average) and 1946–50, in long tons

Year	Long tons	Year	Long tons
1941–45 (average)	61, 143	1948	85, 808
1946	58, 144	1949	95, 904
1947	57, 771	1950	115, 156

[1] Includes some secondary metallic tin in imports whose quantity cannot be separately determined.

CONSUMPTION BY USES

Total domestic consumption of tin was 44 percent more in 1950 than in 1949, as a result of a sharp rise in general manufacturing activity and continued improvement in supplies. For the first time since 1941, tin was free from restrictive Government controls. The total consumed in manufacturing in 1950 was 104,464 long tons (71,191 of primary and 33,273 of secondary), the largest recorded since 1941, when the total was 134,695 (103,086 primary and 31,609 secondary). The use of primary tin increased 51 percent and of secondary 32 percent. The ratio of primary to secondary was slightly greater than in 1949. Five items—tin plate and terneplate, solder, bronze, babbitt, and tinning—accounted for around 90 percent of the total consumed in 1949 and 1950. Tin platers, the largest consumers of primary tin, increased their total use only 19 percent. Next in rank, solder required 79 percent more tin than in 1949. Tonnagewise this increase (12,104 tons) in the use of tin for solder was greater than ever before. More primary tin was required for making solder in 1950 than in any previous year of record, and among all items using primary tin it accounted for the largest increase (10,193 tons). The use of secondary tin for solder increased for the fifth consecutive year. Consumption of primary and secondary tin for other major uses increased in 1950 as follows: Bronze 42 percent, babbitt 41 percent, and tinning 44 percent. Consumption in bronze increased the most (4,313 tons) among items in the secondary tin category. The consumption of primary tin for babbitt showed an increase for the first time since 1944 and was 72 percent more in 1950 than in 1949.

There were indications of the probable return to precontrol practice in the use of tin for some items that had been restricted or prohibited. The larger tonnage of tin used for white metal was mainly accountable to pewter and britannia metal, which had been on the prohibited list. The use of tin for galvanizing was resumed on a small tonnage basis. Collapsible tubes and chemicals used more in 1950 than in any year since 1941. The large increase shown for the item "miscellaneous alloys" mostly reflects the use of tin for Copan, which the Texas City tin smelter began making in January 1950. The quantity of tin per unit specified for some of the terne-metal tonnage was higher in 1950 than in 1949, indicating the probable return to heavier coated ternes.

Tin-plate production rose to a new high in 1950—23 percent more than in 1949 and 22 percent above the previous record year of 1948. Electrolytic lines operating at a high rate established a new record in 1950 and produced 33 percent more tin plate than in 1949. Electrolytic tin plate requires considerably less tin per unit of product than hot-dipped. About 64 percent of the tin used to make tin plate in 1950 was for making hot-dipped and 36 percent for electrolytic, but hot-dipped tin-plate production contributed only 41 percent and electrolytic 59 percent of the total output in 1950. The record of the tin plate and terneplate industry during the past 16 years (table 8) indicates that a greatly expanded tin-plate production now requires no material change in the total tonnage of tin consumed, owing to introduction of electrolytic tin plate during the past decade. The demand for long ternes has been increasing, but there has been a falling off in the tonnage of short ternes. The tin content of terne metal used for long ternes returned to prewar practice in 1950; and, except for 1941, the tonnage produced was greater than in any other year. The production of short ternes in 1950 was about a third of the average annual output before the war. Terneplate production required 52 percent more tin in 1950 than in 1949. Total terneplate production increased 15 percent, with short terne output decreasing 25 percent and long ternes increasing 39 percent.

Since 1925 both the total consumption and the per capita consumption of primary tin in the United States have dropped sharply. During 1925–29, the average population was 118,908,000, and tin consumption was 76,814 long tons or 1.447 pounds per capita. For 1946–50 the population averaged 146,563,000, and primary tin consumption 58,400 tons, which amounted to 0.893 pound per capita. This shows that there was a decrease of 24 percent in tonnage and 38 percent per capita for 1946–50 compared with 1925–29.

This may be attributed, aside from controls, partly to the drop in demand for tin for making foil and collapsible tubes and for weighting silk (tin chloride). In 1929 production of 2,016,003 short tons of tin plate required 27,681 long tons of tin. In 1950 production of 4,767,274 short tons of tin plate required only 35,380 long tons. Owing to the development of electrolytic tin plate, no material change in tin consumption has taken place.

232294—53——77

TABLE 6.—Consumption of primary and secondary tin in the United States, 1941–45 (average) and 1946–50, in long tons

	1941–1945 (average)	1946	1947	1948	1949	1950
Stocks on hand Jan. 1 [1]	46,080	25,789	27,100	25,743	27,070	24,621
Net receipts during year:						
Primary	59,588	56,603	59,882	62,119	47,782	79,992
Secondary	4,319	2,236	2,836	3,004	2,606	3,371
Terne	597	257	417	681	470	997
Scrap	28,067	26,057	26,598	29,840	22,193	30,839
Total receipts	92,571	85,153	89,733	95,644	73,051	115,199
Available	138,651	110,942	116,833	121,387	100,121	139,820
Stocks on hand Dec. 31 [1]	39,838	27,100	25,743	27,070	24,621	31,856
Total processed during year	98,813	83,842	91,090	94,317	75,500	107,964
Intercompany transactions in scrap	2,963	2,091	1,957	2,535	2,167	2,168
Total consumed in manufacturing	95,850	81,751	89,133	91,782	73,333	105,796
Plant losses	998	808	1,033	994	927	1,332
Tin content of manufactured products	94,852	80,943	88,100	90,788	72,406	104,464
Primary	64,085	54,627	59,166	59,863	47,163	71,191
Secondary	30,767	26,316	28,934	30,925	25,243	33,273

[1] Stocks shown exclude tin in transit or in other warehouses on Jan. 1, as follows: 1946, 1,600 tons; 1947, 1,000 tons; 1948, 940 tons; 1949, 328 tons; 1950, 61 tons and 1951, 1,355 tons.

TABLE 7.—Consumption of tin in United States, 1948–50, by finished products, in long tons of contained tin

Product	1948			1949			1950		
	Primary	Secondary	Total	Primary	Secondary	Total	Primary	Secondary	Total
Tin plate	31,503		31,503	29,617		29,617	35,380		35,380
Terneplate	420	252	672	278	348	626	349	603	952
Solder	15,038	6,087	21,125	8,150	7,206	15,356	18,343	9,117	27,460
Babbitt	3,507	3,546	7,053	2,030	2,515	4,545	3,501	2,908	6,409
Bronze and brass	3,952	17,739	21,691	2,360	12,103	14,463	4,178	16,416	20,594
Collapsible tubes	600	39	639	672	43	715	[1] 1,438	[1] 228	[1] 1,666
Tinning	2,298	223	2,521	1,916	158	2,074	2,797	179	2,976
Foil	179	60	239	161	38	199	(2)	(2)	(2)
Pipe and tubing	257	66	323	193	38	231	383	57	440
Type metal	129	1,787	1,916	81	1,693	1,774	184	1,796	1,980
Bar tin	916	132	1,048	636	159	795	1,194	240	1,434
Miscellaneous alloys	170	211	381	245	145	390	1,543	164	1,707
White metal	39	150	189	146	107	253	693	524	1,217
Chemicals (other than oxide)				64	390	454			
Tin oxide	855	633	1,488	270	237	507	869	847	1,716
Miscellaneous				344	63	407	339	194	533
Total	59,863	30,925	90,788	47,163	25,243	72,406	71,191	33,273	104,464

[1] Includes foil.
[2] Combined with collapsible tubes.

TABLE 8.—Tin content of tin plate and terneplate produced in the United States, 1935–50

Year	Total tin plate (all forms)			Tin plate (hot-dipped)			Tin plate (electrolytic)			Tin plate waste—waste, strips, cobbles, etc.		
	Gross weight (short tons)	Tin content (long tons)	Pounds of tin per short ton of plate	Gross weight (short tons)	Tin content (long tons)	Pounds of tin per short ton of plate	Gross weight (short tons)	Tin content (long tons)	Pounds of tin per short ton of plate	Gross weight (short tons)	Tin content (long tons)	Pounds of tin per short ton of plate
1935	1,926,896	27,290	31.7	1,926,896	27,290	31.7						
1936	2,349,402	33,750	32.2	2,349,402	33,750	32.2	----	----	----	----	----	----
1937	2,819,635	39,221	31.2	2,724,278	37,921	31.2	----	----	----	95,357	1,300	30.5
1938	1,691,762	23,545	31.2	1,625,131	22,649	31.2	----	----	----	66,631	896	30.1
1939	2,644,704	36,640	31.0	2,546,216	35,322	31.1	----	----	----	98,488	1,318	30.0
1940	2,758,897	38,674	31.4	2,583,327	36,741	31.9	63,282	348	12.3	112,288	1,585	31.6
1941	3,388,139	44,854	29.7	3,188,713	42,860	30.1	87,836	457	11.7	111,590	1,537	30.9
1942	2,559,169	28,522	25.0	2,428,634	27,538	25.4	82,013	434	11.9	48,522	550	25.4
1943	2,077,102	21,726	23.4	1,684,807	19,386	25.8	327,713	1,787	12.2	64,582	553	19.2
1944	2,503,802	24,968	22.3	1,779,117	20,874	26.3	644,958	3,404	11.8	79,727	690	19.4
1945	2,656,335	26,080	22.0	1,709,412	20,762	27.2	859,636	4,598	12.0	87,287	720	18.5
1946	2,675,910	26,127	21.9	1,716,591	20,770	27.1	882,537	4.702	11.9	76,782	655	9.1
1947	3,731,348	30,980	18.6	1,872,152	22,159	26.5	1,734,535	7,981	10.3	124,661	840	15.1
1948	3,914,323	31,503	18.0	1,848,373	22,028	26.7	1,918,708	8,518	9.9	147,242	957	14.6
1949	3,863,801	29,617	17.2	1,648,001	19,613	26.7	2,030,567	8,814	9.7	185,233	1,190	14.4
1950	4,767,274	35,380	16.6	1,845,009	21,875	26.6	2,693,777	12,110	10.1	228,488	1,395	13.7
	Total terneplate			Short ternes			Long ternes			Terneplate waste—waste		
1935	218,586	1,064	10.9	104,596	644	13.8	113,990	420	8.3	----	----	----
1936	265,585	1,312	11.1	140,319	872	13.9	125,266	440	7.9	----	----	----
1937	292,478	1,397	10.7	162,724	924	12.7	129,754	473	8.2	----	----	----
1938	207,888	1,007	10.9	129,139	739	12.8	78,749	268	7.6	----	----	----
1939	286,876	1,454	11.4	181,959	1,009	12.4	104,917	445	9.5	----	----	----
1940	317,108	1,513	10.7	167,321	933	12.5	149,787	580	8.7	----	----	----
1941	568,957	2,046	8.1	267,675	1,157	9.7	292,301	852	6.5	8,981	37	9.2
1942	307,356	882	6.4	174,366	512	6.6	128,135	356	6.2	4,855	14	6.5
1943	225,327	434	4.3	118,033	225	4.3	105,334	203	4.3	1,960	6	6.9
1944	367,297	740	4.5	177,681	413	5.2	184,757	317	3.8	4,859	10	4.6
1945	371,447	741	4.5	193,586	447	5.2	170,442	281	3.7	7,419	13	3.9
1946	215,754	446	4.6	69,861	178	5.7	142,917	262	4.1	2,976	6	4.5
1947	240,299	501	4.7	92,683	221	5.3	142,818	270	4.2	4,798	10	4.7
1948	324,088	672	4.6	181,141	388	4.8	137,045	272	4.4	5,902	12	4.6
1949	239,641	626	5.9	81,682	177	4.9	150,143	435	6.5	7,816	14	4.0
1950	274,963	952	7.8	60,952	188	6.9	209,223	753	8.1	4,788	11	5.1

STOCKS

Stocks of pig tin and tin in ore were 25 percent higher at the end of 1950 than at the beginning of the year. In addition, about 11,150 tons (10,550 at beginning of year) were in process, in scrap and as secondary tin. Industrial stocks of primary tin were 56 percent higher, with 73 percent of the total plant stock held by tin platers. RFC stocks of tin metal were 22,452 tons at the beginning of the year compared with 18,618 tons (including 390 tons comprising undelivered balances of consumers' sales contracts) at the year's close; stocks of concentrates contained 21,117 tons of tin at the beginning of the year and 15,068 at the close. Ores afloat or in foreign ports at the beginning of the year contained 2,919 tons of tin and at the end of the year 5,606 tons. Stocks of tin in New York at the end of 1950, according to reports to the Commodity Exchange, were 1,438 tons.

TABLE 9.—Stocks of virgin pig tin in the United States, Dec. 31, 1945–50, in long tons [1]

	1945	1946	1947	1948	1949	1950
At consumers' plants	14,102	14,532	13,677	14,349	13,771	20,576
At other warehouses and in transit	1,600	1,000	940	328	61	1,355
Held by jobbers	69	124	157	100	292	384
Total consumers' stocks	15,771	15,656	14,774	14,777	14,124	22,315
Afloat to United States (estimated)		1,570	6,220	25	8,500	3,500
Total stocks [1]	15,771	17,226	20,994	14,802	22,624	25,815

[1] Excludes Government purchases delivered for stockpiling or at Texas City smelter. Also excludes tin in process and secondary pig tin.

PRICES

The tense situation in Asia, fear of interruption in supplies, events in Korea, and national stockpiling brought on extraordinary price movements in tin during 1950. The year opened with the New York market price for Straits tin at 77.5 cents a pound and closed with the price at $1.50; the average for the year was 95.56 cents (99.32 cents in 1949). After averaging 76.28 cents during the first half, the price moved sharply upward during the second half to an average of 114.84 cents. On February 23 a price of 74⅛ cents was recorded—the lowest since 1947. On November 8, by contrast, the highest price recorded in the regular market was $1.63½ a pound, with a little business transacted in spot at $1.70.

On August 16, 1941, a ceiling price of 52 cents per pound was established by the Government (Office of Price Administration and Civilian Supply) and this price remained in force until November 12, 1946. The export price was raised to 58 cents per pound on March 1, 1946. After price controls were removed, November 13, 1946, the RFC (Office of Metals Reserve) set 70 cents as the domestic price; this was raised to 80 cents on April 1, 1947, and to 94 cents on December 19, 1947. On June 1, 1948, the RFC announced a new price of $1.03, which held until September 28, 1949; it was then lowered to 96 cents and to 95 cents on October 24, at which level it remained until reduced to 85 cents on November 21, 1949. A series of 12 separate mark-downs then brought the price to 74.50 cents on January 30, 1950.

Prices on the open market sagged to 74.125 cents, the lowest since 1947, during the period February 23 to February 28, 1950, reflecting the outcome of bilateral negotiations between an Anglo-Malayan delegation and the United States on a long-term tin purchase contract for stockpiling. Britain refused the United States a discount on the grounds that it would either interfere with the recently decontrolled tin market or would involve a subsidy to the United States by the British taxpayer equal to the difference between the market price and the selling price to the United States. There also were other difficulties, such as choice of market to be used for price fixing.

TABLE 10.—Tin prices, 1925–29 (average) and 1946–50

	1925–29 (average)	1946	1947	1948	1949	1950
Average prices:						
New York:[1]						
Straits tin .... cents per pound..	56.64	[2] 54.58	77.94	99.25	99.316	95.557
99.75-percent tin (English refined) cents per pound..	(3)	[4] 54.208	77.512	98.692	(3)	(3)
99-percent tin .... do....	55.50	[5] 53.708	76.896	97.562	(3)	(3)
London:[6]						
Standard tin .... £ per long ton..	254.6	[7] 321.2	426.3	548.1	600.8	745.8
Do .... cents [8] per pound..	55.17	57.83	77.66	98.64	98.92	93.25
Premium allowed over standard:						
Straits .... £ per long ton..	5.1	(3)	(3)	(3)	(3)	(3)
Banka .... do....	6.9	(3)	(3)	(3)	(3)	(3)
English .... do....	–.7	(3)	(3)	(3)	(3)	(3)
Price indexes (1925–29 average=100):						
Straits tin (New York)	100	96	138	175	175	169
Copper (New York)	100	93	143	150	131	145
Lead (New York)	100	109	196	241	206	178
Nonferrous metals [9]	100	100	142	159	146	151
All commodities [9]	100	121	155	168	158	161

[1] American Metal Market.
[2] Maximum price for grade A, 52 cents until Nov. 10, 1946; 70 cents thereafter.
[3] Data not available.
[4] Maximum for grade B, 99.75–99.79 percent, and grade C, Cornish refined.
[5] Maximum for grade D, 99.0–99.74 percent.
[6] Metal Bulletin, London.
[7] British Government maximum. To Sept. 26, £300, thereafter £380 10s.
[8] Conversion of British quotations into American money based upon average rates of exchange recorded by Federal Reserve Board.
[9] Based upon price indexes of U. S. Department of Labor.

On March 13, 1950, the RFC withdrew its fixed daily quotations and under a new selling plan began marketing on an average price basis to be determined by published quotations in the trade. RFC prices for Longhorn 3-Star and grade A foreign brands would be the average, for the calendar week following the date of sale, of the quotations for prompt grade A or Straits tin published in any approved daily metal periodical or trade journal. This virtually removed RFC as a source of prompt tin, with prices too indefinite for practical buying.

The price of Straits tin in New York increased to 74.5 cents on March 2, where it remained until it began advancing again on March 13, after the action by RFC. The upward movement was reinforced by market sentiment following the opening of the International Tin study Group in Paris on March 20, which was expected to stabilize prices at higher levels. By March 23 the price had moved up to 77¾ cents. The plan for establishing international control met with some difficulty, and the market reacted in a downward trend until 74.25 cents was reached on April 3, but the price moved up to 76 cents on April 6, and increased further to 77½ cents on April 20. By the first week in June it had reached 78½ cents, after which there was an erratic period, with a drop to 76¾ cents on June 24, on the eve of the North Korean invasion. At this point, the trend turned upward again, owing largely to the prospect of reduced offerings by the British Ministry of Supply, the price reaching $1.04½ on August 25. The London market was in a turmoil on the afternoon of August 10 as a consequence of the Ministry of Supply decision, and there were no dealings. There was a total of 16 advances and 9 declines during August in daily average prices with unprecedented daily fluctuations.

In the latter part of August RFC announced that it was resuming sales of grades of tin below grade A. New York prices declined to 95½ cents, only to resume a daily upward course immediately (without a single setback until November 8). The price situation had become chaotic, with most sellers in New York temporarily withdrawn from the market. Spot tin was quoted at $1.70 on November 8, with few transactions. European observers were holding to the opinion that United States national stockpiling had been a major factor in driving prices upward to unreasonable levels; but the United States was acquiring tin under Belgian, Netherlands, and Indonesian contracts and not in the open market.

The price situation remained confused during the remainder of November and December, with the news from Korea dominating the market. However, the market was fairly stable at the year end, with a price on December 30, 1950, of $1.51, or nearly 100 percent higher than at the beginning of the year.

In London the monthly average price for standard tin in 1950 ranged downward from £600.5 per long ton in January to £595.8 in May, thence upward to £784.8 in August; it weakened to £776.5 in September, and advanced sharply to £1,163.9 in December. The average was £745.8 for 1950 compared with £600.8 in 1949. An all-time high of £1,300 was reached on November 8, 1950, mainly because of the decision of the British Ministry of Supply not to release any more tin from its stock after November 10. On December 29, 1950, the price was £1,155 (or 144.37 cents a pound).

The Singapore market price for Straits ex works averaged £723.1 for 1950; for the first 6 months it averaged £580 per long ton (equivalent to 72.45 cents a pound) and for the second half £867 (108.42 cents per pound). The 1950 opening price, which also was the lowest for the year, was £562. The highest price was £1,268.5 reached on November 8, after a total advance of £407 without a single set back from October 19. At the close of 1950 the price was £1,140.6.

FOREIGN TRADE [4]

Tin, one of the principal imports of the United States, ranked ninth in value among all the commodities received in 1950. Imports of pig tin and ore and exports of tin plate are the principal tin items in foreign trade of the United States. In 1950 imports of pig tin for consumption totaled 82,837 long tons, the highest tonnage since 1941 and an increase of 38 percent over 1949; imports of tin in concentrates were 25,960 long tons. Total exports of tin plate, taggers tin, and terneplate (including long ternes) were 442,953 tons, an 11-percent decrease from 1949.

Further data on imports and exports of tin and tin plate are shown in tables 11 through 16. Tin contained in babbitt, solder, type metal, and bronze imported and exported is accounted for in the Lead and Copper chapters of this volume.

[4] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

Malaya was the principal source of metal in 1950, furnishing 65 percent of the total. Other important sources of metal in 1950 were United Kingdom, Belgium-Luxembourg, and the Netherlands. Imports from the United Kingdom increased 189 percent over 1949.

Imports of tin concentrates (tin content) into the United States decreased 32 percent in 1950, as compared with 1949. Bolivia, the chief source, supplied concentrates containing 14,419 long tons of tin and accounted for 56 percent of the total. The second largest source of tin imported as concentrates was Indonesia, supplying 6,925 tons. Other smaller sources included Thailand, Belgian Congo, Burma, Japan, and Mexico. Bolivia was the source of 68 percent of the tin in concentrates imported from 1941 through 1950, inclusive.

Since 1941 the United States has been the world's principal source of tin plate. In 1950 exports of tin plate, taggers tin, and terneplate, including long ternes, decreased 11 percent from 1949, and 20 percent from the high level attained in 1947. Exports to Canada, India, Portugal, Chile, France, Norway, and Egypt declined, while there were significant increases in exports to Australia, Cuba, and the Union of South Africa.

Exports of hot-dipped tin plate totaled 348,944 long tons, valued at $66,089,402 in 1950. Principal countries of destination were the Netherlands (50,256 tons), Australia (47,800 tons), Brazil (34,570 tons), Union of South Africa (27,997 tons), and Italy (25,673 tons). Exports of electrolytic tin plate totaled 78,535 tons, valued at $13,397-425. This material was shipped to 43 countries, the leading ones being Brazil, the Philippines, the Union of South Africa, Cuba, Turkey, Mexico, and Australia.

According to the American Iron and Steel Institute, producers in 1950 shipped for export 490,230 short tons (519,618 in 1949) of tin plate, of which 392,651 tons (402,821) were hot-dipped and 97,579 (116,797) electrolytic.

TABLE 11.—Foreign trade of the United States in tin concentrates and tin, 1946–50

[U. S. Department of Commerce]

Year	Imports				Exports			
	Concentrates (tin content)		Bars, blocks, pigs, grain, or granulated		Ingots, pigs, bars, etc.			
					Domestic		Foreign	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1946	38,070	$50,623,185	15,559	$18,554,896	859	$1,153,936	22	$31,939
1947	29,410	43,220,686	24,899	42,684,651	415	650,162	5	9,887
1948	37,492	72,170,372	49,196	103,322,952	78	163,428	13	27,699
1949	38,311	78,175,836	60,224	[1] 133,707,223	76	176,795	78	145,370
1950	25,960	47,163,305	82,837	152,903,126	287	594,587	512	990,000

[1] Revised figure.

TABLE 12.—Tin concentrates (tin content) imported for consumption in the United States, 1943–50, by countries

[U. S. Department of Commerce]

Country	1943		1944		1945		1946		1947		1948		1949		1950	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Algeria	8	$7,125														
Argentina			60	$77,498												
Australia									2	$1,036						
Belgian Congo	4,094	4,511,588	7,549	9,368,309	7,401	$9,214,245	7,214	[1]$8,981,430	379	631,060			695	$1,526,556	1,526	$2,932,088
Bolivia	17,351	[2]20,005,901	27,701	32,160,861	25,936	35,376,704	28,520	[2]38,901,013	20,984	30,654,538	20,367	$37,855,610	19,265	[2]37,363,264	14,419	25,912,116
Brazil							7	9,821	1	2,493	2	3,365				
British East Africa							(3)	259								
Burma													11	11,329	209	310,850
Cameroon	72	83,490	177	254,844	46	68,136	37	55,367								
China											16	15,737	348	622,548	63	110,336
French Equatorial Africa	211	211,810			83	123,346	21	31,500								
Indonesia							2,206	2,532,488	5,208	7,315,323	13,195	26,652,641	15,223	32,851,078	6,925	12,905,101
Japan															147	183,933
Malaya													22	48,000	26	51,201
Mexico	121	134,337	61	80,543	13	13,462			5	5,982	36	12,331	116	150,583	118	227,405
Portugal							38	56,767					61	122,441	70	111,129
Siam (Thailand)									2,826	4,601,681	3,865	7,619,185	2,570	5,480,037	2,457	4,419,146
Spain											11	11,436				
United Kingdom							27	54,540	5	8,573	(3)	67				
Total	21,857	24,954,251	35,548	41,942,055	33,479	44,795,893	38,070	50,623,185	29,410	43,220,686	37,492	72,170,372	38,311	78,175,836	25,960	47,163,305

[1] Revised figure.
[2] Imports credited to Chile by the Department of Commerce have been added to Bolivia.
[3] Less than 0.5 ton.

TABLE 13.—Tin [1] imported for consumption in the United States, 1947–50, by countries

[U. S. Department of Commerce]

Country	1947		1948		1949		1950	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
Belgian Congo	1,050	$1,840,553	2,046	$4,463,295	3,735	$8,293,083	1,506	$2,600,907
Belgium-Luxembourg	3,500	6,263,723	6,874	15,355,653	7,579	17,179,194	8,137	16,379,673
Bolivia			49	95,279	246	596,367	183	407,800
Burma					6	9,805		
China	2,639	4,323,184	1,615	3,172,982	[2] 3,689	[2] 6,721,865	1,665	2,742,207
Germany							162	314,910
Indochina					50	78,919		
Indonesia	39	66,850			[2] 8	[2] 16,080		
Italy							395	717,952
Japan					4	6,250	542	851,486
Lebanon							18	55,893
Malaya	13,432	23,207,914	34,176	71,389,379	34,374	77,317,247	53,673	97,476,255
Netherlands			843	1,899,249	[2] 7,616	[2] 17,111,480	7,616	13,773,884
Portugal	(3)	66	95	195,223			1	1,059
Siam (Thailand)	4,031	6,648,718	2,978	5,591,093			500	950,518
United Kingdom	208	333,643	520	1,160,799	2,917	[2] 6,376,933	8,439	16,630,582
Total	24,899	42,684,651	49,196	103,322,952	60,224	[2] 133,707,223	82,837	152,903,126

[1] Bars, blocks, pigs, grain, or granulated.
[2] Revised figure.
[3] Less than 0.5 ton.

TABLE 14.—Foreign trade in tin plate, taggers tin, and terneplate in various forms, 1946–50, in long tons

[U. S. Department of Commerce]

Year	Tin plate, taggers tin, and terneplate		Tin-plate circles, strips, cobbles, etc. (exports)	Waste-waste tin plate (exports)	Terneplate clippings and scrap (exports)	Tin-plate scrap	
	Imports	Exports				Imports	Exports
1946	298	355,794	4,030	6,690	590	24,530	141
1947	585	553,748	5,340	21,209	9	30,797	54
1948	184	548,021	3,247	28,121	278	41,084	
1949	12,218	498,371	3,018	41,865	227	41,028	
1950	3,829	442,953	7,004	54,747	144	42,394	562

TABLE 15.—Tin plate, and terneplate (including long ternes) exported from the United States, 1949–50, by principal countries of destination

[U. S. Department of Commerce]

Destination	1949		1950	
	Long tons	Value	Long tons	Value
Algeria	4,102	$815,134	2,013	$399,271
Argentina	16,607	3,277,074	19,532	4,229,394
Australia	42,637	8,385,745	52,260	9,906,750
Belgium-Luxembourg	10,918	2,143,343	15,246	2,731,309
Brazil	40,003	7,794,469	44,359	8,414,306
British East Africa	3,276	550,107	1,613	262,385
Canada	29,569	4,762,289	7,070	1,080,421
Chile	7,897	1,528,610	1,302	246,823
China	1,895	372,428	1,343	249,792
Colombia	3,859	715,865	6,090	1,140,256
Cuba	11,092	2,211,706	18,074	3,340,109
Denmark	15,161	2,931,342	17,344	3,175,829
Egypt	4,888	928,968	1,323	208,342
France	7,249	1,399,858	936	207,484
French Morocco	10,629	2,162,855	11,146	2,194,399
Greece	5,955	1,062,214	5,740	965,149
Hong Kong	4,740	696,995	2,255	273,202
India	15,066	2,708,593	4,027	673,253
Indochina	885	150,915		
Indonesia	5,198	1,032,466	3,433	697,833
Ireland	1,971	380,402	828	142,648
Israel	3,793	750,158	2,670	450,322
Italy	26,518	5,345,010	26,838	4,896,252
Japan	3,358	753,752	365	74,934
Lebanon	1,120	206,016	1,782	310,731
Madagascar	1,195	242,456		
Malaya	3,977	690,293	1,889	255,128
Mexico	15,173	3,106,323	12,920	2,276,674
Netherlands	56,136	11,207,608	54,110	10,368,561
New Zealand	4,633	919,159	1,140	203,730
Norway	21,471	4,060,002	17,562	3,047,558
Pakistan	5,361	980,343	1,475	234,546
Peru	2,551	540,669	2,842	562,936
Philippines	10,284	1,803,789	11,888	1,959,570
Portugal	10,042	1,995,270	2,088	400,511
Siam (Thailand)	4,093	568,656	2,954	429,649
Spain	3,165	652,046	738	147,945
Sweden	7,280	1,426,023	11,283	2,057,282
Switzerland	9,315	1,760,879	9,515	1,761,626
Tunisia	1,703	340,322	640	123,508
Turkey	10,662	1,903,676	6,927	1,204,687
Union of South Africa	30,659	5,940,554	35,470	6,342,726
Uruguay	5,324	1,054,382	7,493	1,413,649
Venezuela	2,733	514,569	1,953	378,598
Other countries	14,228	2,889,635	12,477	2,295,030
Total	498,371	95,662,968	442,953	81,735,108

TABLE 16.—Foreign trade in miscellaneous tin, tin manufactures, and tin compounds, 1946–50

[U. S. Department of Commerce]

Year	Miscellaneous tin and manufactures						Tin compounds	
	Imports			Exports				
	Tin foil, tin powder, flitters, metallics, tin and tin-plate manufactures, n. s. p. f.[1] (value)	Dross skimmings, scrap, residues, and tin alloys, n. s. p. f.		Tin cans, finished or unfinished		Tin scrap and other tin-bearing material except tin-plate scrap (value)	Imports (pounds)	Exports (pounds)
		Pounds	Value	Long tons	Value			
1946	$141,567	1,100	$596	13,815	$3,790,847	$482,733	308	(2)
1947	162,187	233,932	27,334	26,061	8,160,356	829,386	30,760	(2)
1948	119,287	1,679,331	659,450	36,450	11,208,859	1,684,402	10,917	(2)
1949	189,564	[3] 1,163,875	[3] 424,908	31,087	10,263,790	2,245,217	980	41,004
1950	215,484	6,293,459	2,146,340	28,946	10,448,917	869,404	75,825	122,716

[1] Data revised to include tin-plate manufactures, not specially provided for.
[2] Not separately classified.
[3] Revised figure.

TECHNOLOGY

The Tin Research Institute released for publication several technical reports on varied subjects relating to tin and its industrial application.[5] The General Electric Co. announced a new chemical product called R–108, which it is claimed offers a great deal of promise in a coating to replace tin used in food containers and can be substituted in many applications for expensive and hard-to-get alloys. The Federated Metals Division, American Smelting & Refining Co., announced development of a group of solders that permit savings of 50 percent or more tin normally used for solders. The new tin-conserving solders are basically silver-tin-lead alloys compared with the usual tin-lead variety. The addition of a small percentage of silver permits a marked reduction in the tin content and at the same time gives a joint at least as good as that of the original alloy. United States patents issued during 1950 relative to tin include the following:

Nelson, George C., Relates to the Manufacture of Tin Plate: U. S. Patent 2,497-164, Feb. 14, 1950.

The Bureau of Mines is now making a laboratory study of sulfidization of cassiterite and volatilization of tin from low-grade Bolivian tin-ore. Preparations have been made for further tests on a larger scale to apply what has been learned to the continuous volatilization of tin from various Bolivian tin ores. A summarized report on the tin situation in the United States, which was published during 1950,

[5] Information concerning the institute's work and publication can be obtained in the United States from Tin Research Institute, Inc., 429 West 6th Ave., Columbus, Ohio.

included a progress report on this work.[6] The presence of tin was detected by spectrographic analysis in the minerals allanite, boulangerite, geocronite, and manganophyllite.[7] Preliminary studies indicating that a partial reduction leaching process can compete favorably with thermal smelting in producing tin were the subject of an article.[8]

WORLD REVIEW

INTERNATIONAL TIN STUDY GROUP

Representatives of eight major tin producing and consuming countries met in London in October 1946 and agreed that a Study Group should be established. The International Tin Study Group was organized at a meeting in Brussels in April 1947. A brief report on the meetings held by the Study Group through 1950 has been published as follows:[9]

At the first meeting of the International Tin Study Group held in Brussels in April, 1947, terms of reference for the Group were agreed. The principal features of these terms of reference are (1) that membership shall be open to all countries principally interested in the production, consumption or trade in tin; (2) that the Group shall have the functions of considering possible solutions to any problems or difficulties which are unlikely to be resolved by the ordinary development or world trade in tin; and (3) that the Group should establish a permanent secretariat.

The second Group Meeting was held in Washington in April, 1948. The Group reviewed the world tin position and agreed to recommend to member-governments the setting up of a Working Party to examine the appropriateness and practicability of framing an intergovernmental agreement on tin conforming to the general spirit and principles of the Charter of the International Trade Organization. The meeting of this Working Party was held in The Hague in June, 1948.

The Group held its third meeting in The Hague on October 25th/29th, 1948. The Group had before it the report of the Working Party. The purport of this report was that it would be appropriate and practicable to conclude an international tin agreement on the lines set out in the report. The Group modified these proposals in certain respects and forwarded to the member-governments a recommendation that, after certain preparatory steps, the member-governments should be asked to inform the Secretary whether they would be disposed to enter into an agreement on the broad lines proposed, and were willing to attend a conference to put the agreement into final form and to conclude it.

The Fourth Group Meeting was held in London on June 14th–22nd, 1949. The Group received the Report of the Drafting Committee set up at their last meeting and noted that the summoning of an International Commodity Conference on tin in the spring of 1949 had not been considered timely by all member-governments. The Group set up a Working Party to prepare a statement on the position and prospects of the tin industry and also to prepare the draft of an Intergovernmental Commodity Control Agreement.

---

[6] Boyd, James Statement on Tin before the Public Lands Committee, House of Representatives, Aug. 8, 1950: Bureau of Mines, 1950, pp. 28–31.

[7] Kauffman, A. J., Jr., Mortimore, D. M., and Hess, H. D., A Study of Certain Uncommon Minerals in the Pacific Northwest: Bureau of Mines Rept. of Investigations 4721, 1950, pp. 3, 7, 13, and 17.

[8] Fink, Colin G., and Strauss, Howard J., New Process May Make Low-grade Tin Ore Profitable: Eng. and Min. Jour., vol. 151, No. 12, December 1950, pp. 96 and 97.

[9] International Tin Study Group, Statistical Bulletin: vol. 4, No. 1, January 1951, inside cover page.

The Working Party met in The Hague from October 26th to November 2nd, 1949. It prepared the statement and the draft tin control agreement for the consideration of the member-governments. The draft agreement was designed, in the spirit of the Havana Charter, to establish equilibrium between supply and demand on conditions equally satisfactory to producers and consumers.

The Fifth Group Meeting was held in Paris on March 20th–29th, 1950. The Group considered, amended and modified the Draft Agreement drawn up by The Hague Working Party. The Group adopted, by a majority, a resolution requesting a United Nations Conference to be convened to discuss a commodity control agreement on tin.

The United Nations' Tin Conference was held in Geneva from October 25th to November 21st, 1950, attended by delegations from 20 countries. The Paris Draft Agreement and other proposals relating to a buffer stock, the control of exports and action in the event of a tin shortage were considered. The Conference concluded that the various proposals submitted differed so widely in their methods of operation that further examination by governments was needed. It instructed the chairman to keep under review the further discussions and conclusions of the International Tin Study Group; to consult, on the basis thereof, with the Steering Committee of the Conference with a view to deciding upon a suitable date for the resumption of the Conference; and, if satisfied that the conditions for a resumption exist, to request the United Nations to invite those governments which were invited to the present meetings to come together again. The Conference then adjourned.

WORLD MINE PRODUCTION

World mine production of tin, exclusive of U. S. S. R., increased 3 percent in 1950. Of the total output, Asia supplied 64 percent; South America, 19 percent; Africa, 14 percent; and other sources, 3 percent. Most of the increase was provided by Malaya and Indonesia. Output in 1950 was 4,600 long tons greater than in 1949. Production in 1950 was 2 percent above the 1925–29 average and amounted to 97 percent of the 1935–39 average and about 68 percent of the 1941 peak. U. S. S. R. tin production was estimated as not having exceeded 8,000 metric tons of metallic tin in 1949. The target for 1950 was estimated at 12,000 tons.[10]

WORLD SMELTER PRODUCTION

Smelter production of tin in the world, exclusive of U. S. S. R., increased only 3 percent in 1950 over 1949. The Malayan tin-smelting plants at Penang and Singapore had a 10-percent increase in output, supplied 40 percent of the total, and were (as in 1949) the world's most important sources of pig tin. Next in rank as important tin-smelting sources are the United States, United Kingdom, Netherlands and Belgium. Smelters in these countries supplied 93 percent of the world's tin in 1950.

About 67 percent of the world smelter output in 1950 was for the United States (in 1949, 60 percent).

---

[10] Metal Bulletin (London) A Survey of the Soviet Union's Nonferrous Metals Industries: No. 3490, May 9, 1950. pp. 10–20.

TABLE 17.—World mine production of tin (content of ore), by countries, 1940–44 (average) and 1945–50, in long tons

[Compiled by Berenice B. Mitchell]

Country	1940–44 (Average)	1945	1946	1947	1948	1949	1950
North America:							
Canada	232	379	390	319	309	276	355
Mexico	333	174	262	174	182	358	290
United States	24	----	----	1	5	68	94
Total North America	589	553	652	494	496	702	739
South America:							
Argentina	1, 091	974	600	522	273	268	[1] 300
Bolivia (exports)	39, 735	42, 487	37, 619	33, 266	37, 336	34, 115	31, 213
Brazil	65	122	269	295	570	325	[1] 240
Peru	69	54	31	51	64	44	[1] 72
Total South America	40, 960	43, 637	38, 519	34, 134	38, 243	34, 752	31, 825
Europe:							
France	----	10	10	43	84	73	[1] 84
Germany	621	----	----	100	----	[1] 120	[1] 120
Italy	188	34	107	50	----	----	----
Portugal [2]	1, 345	576	352	361	706	785	690
Spain	198	1, 141	921	303	261	666	[1] 575
United Kingdom	1, 428	1, 152	793	898	1, 281	1, 212	960
Total Europe [3]	3, 780	2, 913	2, 183	1, 755	2, 332	2, 856	2, 429
Africa:							
Belgian Congo	15, 765	17, 077	14, 091	14, 897	13, 539	13, 760	13, 700
French Cameroon	213	116	111	119	102	73	67
French Morocco	14	8	9	----	----	----	----
Mozambique	7	3	2	1	1	----	----
Nigeria	12, 465	11, 224	10, 333	9, 133	9, 237	8, 824	8, 258
Northern Rhodesia	7	18	6	1	----	7	4
Southern Rhodesia	229	125	100	122	105	70	65
South-West Africa	129	184	177	146	111	123	100
Swaziland	107	53	37	23	20	32	37
Tanganyika (exports)	194	138	128	92	97	113	121
Uganda (exports)	299	215	206	154	190	128	198
Union of South Africa	504	501	487	483	457	471	720
Total Africa	29, 933	29, 662	25, 687	25, 171	23, 859	23, 601	23, 270
Asia:							
Burma	2, 525	400	342	1, 792	1, 147	1, 781	[1] 1, 682
China (estimate)	8, 200	1, 500	2, 500	4, 300	4, 800	4, 200	3, 600
Indochina	962	42	----	----	30	40	62
Indonesia	25, 754	1, 050	6, 419	15, 915	30, 562	28. 965	32, 099
Japan	1, 462	56	57	110	118	190	326
Malaya	42, 628	3, 152	8, 432	27, 026	44, 815	54, 910	57, 537
Siam (Thailand)	9. 983	1, 775	1, 056	1, 401	4, 240	7, 817	10, 364
Total Asia	91, 514	7, 975	18, 806	50, 544	85, 712	97, 903	105, 670
Oceania: Australia	3, 022	2, 282	2, 127	2, 445	1, 874	1, 973	2, 472
World total [3]	169, 798	87, 000	88, 000	114, 500	152, 500	161, 800	166, 400

[1] Estimated by authors of the chapter or in a few instances taken from the Statistical Bulletin of the International Tin Study Group, The Hague.
[2] Excluding mixed concentrates.
[3] Excluding production of U. S. S. R., estimates for which are given in the text.

TABLE 18.—World smelter production of tin, by countries, 1940–44 (average) and 1945–50, in long tons

[Compiled by Berenice B. Mitchell]

Country	1940–44 (average)	1945	1946	1947	1948	1949	1950
Argentina	714	469	837	433	254	235	[1] 300
Australia	3,046	2,359	2,225	2,371	1,885	1,955	2,013
Belgian Congo	10,917	8,518	3,414	3,084	3,875	3,247	3,238
Belgium			1,405	12,059	10,469	8,996	9,512
Bolivia (exports)		1		26	81	405	393
Brazil	46	169	178	220	185	157	[1] 240
Canada	232	379	390	319	308	276	356
China	6,185	3,268	1,929	3,907	[1] 4,800	[1] 4,200	[1] 3,600
Germany (Federal Republic)	814				26	[1] 120	[1] 120
Indochina	197	14			32	[1] 60	[1] 60
Indonesia	14,221	844			136	126	32
Italy	127	6	75	46			
Japan	2,194	121	162	53	145	290	390
Malaya	60,137	3,038	11,533	29,318	49,707	62,737	68,747
Mexico	253	166	263	172	181	358	290
Netherlands	593		945	8,981	16,402	19,247	21,027
Norway	80	80	308				
Portugal	1,662	182	114	373	282	218	[1] 240
Southern Rhodesia	33	117	80	121	127	75	80
Spain	187	1,111	1,440	704	483	803	844
Siam (Thailand)	1,178	1,652	389	141			2
Union of South Africa	545	1,033	858	601	554	595	717
United Kingdom	36,089	27,549	29,121	28,083	[2] 31,002	[2] 28,384	[2] 27,310
United States [3]	14,354	40,475	43,500	33,300	36,703	35,834	33,118
Total (estimate)	153,804	91,600	99,200	124,300	157,600	168,300	172,600

[1] Estimated by authors of the chapter or in a few instances taken from Statistical Bulletin of the International Tin Study Group, the Hague.
[2] Beginning January 1948, includes production from imported scrap and residues refined on toll.
[3] Including tin content of ores used direct to make alloys.

REVIEW BY COUNTRIES

Australia.—Production of tin in concentrates during 1950 increased 499 tons over 1949, an increase of 25 percent. Domestic smelter production amounted to 2,013 tons, a 3-percent increase. Concentrates treated were derived chiefly from the Tableland Tin Dredging, N. L., of Mount Garnet, Queensland. This company is the largest tin producer in Australia. The present rate of operations will exhaust the property in about 2 years. Examination of neighboring areas has been made without disclosing anything of value to the company, and it appears that there is no prospect of prolonging the life of the Return Creek area. The company has concluded arrangements with Alluvial Prospectors, Ltd., to acquire its rights over the Smith's Creek area, which has been churn-drilled and contains 50,000,000 cubic yards of ground of an average value of 11.46 ounces tin oxide per cubic yard; it is anticipated that substantial extensions of yardage will be obtained by further drilling. Moreover, it has been estimated that, based on average operations and recoveries by the dredge, the average yearly output from the new property will approximate 1,000 tons of tin concentrate. Plans for constructing a tin-plate mill at Port Kembla, New South Wales, remain in an embryonic stage.

Belgian Congo.—The Belgian Congo production of tin in concentrates was 13,700 long tons compared with 13,760 in 1949. Belgian Congo, including Ruanda-Urundi, contributed 59 percent of Africa's 1950 total tin production. Tin contained in exports of concentrates totaled 11,034 long tons, of which United States received 1,550 long tons and Belgium 9,484 long tons. Exports of metal from Belgian Congo were 3,604 long tons, of which United States received 2,100 long tons and Belgium 1,504 long tons. Stocks of tin metal decreased from 79 tons at the beginning of 1950 to 13 tons at the end. Stocks of tin in concentrates decreased from 686 tons at the beginning of 1950 to 673 tons at the end.

A new ore-purchase contract for tin was negotiated in February 1950 between United States and Belgian Congo tin producers.

The Economic Cooperation Administration made available $1,700,000 in Marshall Plan credit funds to the Compagnie Géologique et Minière des Ingenieurs et Industriels Belges (Géomines) for plant construction to treat the unaltered greissen underlying the eluvial ore bodies from which past production originated. By 1954 this company will be producing at least 37 percent of the total Congo output.

Bolivia.—Bolivia exported 9 percent less tin in concentrates in 1950 than in 1949. Total tin contained in exports of concentrates in 1950 was 30,820 long tons. Nearly 44 percent was consigned to the United States, with approximately 53 percent to the United Kingdom, leaving about 850 tons for delivery to Western Germany, Argentina, Belgium, and Chile. There were no great changes in the relative export shares of the several mine groups. That of Patino Mines increased from 42 percent in 1949 to 44 percent in 1950; Hochschild decreased from 25 percent in 1949 to 23 percent in 1950, Aramayo increased from 6 percent in 1949 to 7 percent in 1950. Exports of metal from the Oruro smelter were 393 tons in 1950, chiefly to the United States.

Tin prices, stimulated by the outbreak of the Korean War, began an upward trend and by the end of the calendar year had risen phenomenally, reaching an all-time high in February 1951. Producers who had fixed their production schedules at an annual rate of 30,000 to 32,000 metric tons of fine tin in concentrates, expecting that prices would remain steady, adopted a wait-and-see policy while making plans to resume exploitation of low-grade ores, abandoned as unprofitable after the price slump of late 1949. At the end of July, tin miners were further encouraged when the RFC contract was signed with the provision that all tin produced in the first half of the year, which in the absence of the contract had accumulated at Chilean and Peruvian ports, would be liquidated at the average New York price for the months of July, August, and September. The Hochschild Co. stated this average to be 94 cents.

The supreme decree of August 11 required producers to surrender to the Central Bank, at a rate of 60 bolivianos to the dollar, 100 percent of all foreign exchange derived from mineral exports. After being convinced by the mining industry that the companies could not continue operations under such restrictions, the Government issued a series of decrees designed to stimulate production by modifying the decree of August 11. The three major tin-producing companies, which by a special decree on October 30 were permitted to retain 40 percent of their foreign exchange to cover foreign currency costs, signed contracts with the Government in which they agreed to increase production within 6 months to an annual rate of 26,250 metric tons of tin in concentrates. This represents 75 percent of the total production objective of 35,000 tons per year set in the October 30 decree. The

Patino group was assigned 59 percent of the larger production quota, Hochschild 30.5 percent, and Aramayo 10.5 percent. Medium producers of high-grade tin concentrates were excepted from the provisions of the August 11 decree by the decree of November 23, while special foreign-exchange surrender regulations for small producers of all metals exporting through the Banco Minero were established in the decree of November 30. A decree of December 15 regulated foreign-exchange deliveries of direct exporters of low-grade tin concentrates.

The decree of October 30 also requires the mining companies to set aside 1,500 bolivianos per ton of exports for housing construction and 1,000 bolivianos per ton of exports for other facilities for mine workers when the price of tin exceeds 90 cents per pound.

Brazil.—During 1950 the Department of Mineral Production (D. N. P. M.) began prospecting newly discovered deposits of cassiterite in Sierra dos Tartarugais, Ampa Territory, and in the Basin of Rio das Mortes and Carandai, Minas Gerais, Brazil's principal sources of tin. In San Jose del Rei, where deposits have been worked since 1943, installations for obtaining metallic tin have been modernized and five foundries are now operating. The production of tin in concentrates in 1950 was estimated at 240 long tons compared with 325 tons in 1949. Output of tin plate at the Volta Redonda steel plant was 33,491 long tons in 1950 compared with 18,300 tons in 1949.

Burma.—Production of tin in concentrates was estimated at 1,682 long tons in 1950, a 6-percent decrease from 1949. Exports of tin in concentrate were about 1,511 long tons, of which 1,007 were shipped to the Malays for smelting. With intensification of Civil War many records were destroyed, and the Burmese Government was beset with difficulties in collecting reliable statistics. Throughout the year the Mawchi mine was completely isolated from the rest of Burma by insurgent occupation, and production was restricted to a negligible quantity, obtained from tributers. The mine and mill installations were on a care and maintenance basis. It is not expected that mining activity at Mawchi will be resumed while the area remains under rebel control. Conditions in the Taroy district continued to be most unsettled. After a long period of frequent raids, the mine managers and European staff members were finally expelled by the Communists during January 1951. On October 5, 1950, the Burmese Parliament amended the Special Company Act in such a way as to allow participation of the Burmese Government with private companies in joint development of mineral resources.

Indonesia.—In 1950, Indonesia was the second-largest tin producer in the world. Production of tin in concentrates totaled 32,099 long tons, an 11-percent increase from 1949. The Indonesian output of tin represented 19 percent of the world total. Tin production in Indonesia is confined to the islands of Banka, Billiton, and Singkep, which in 1950 supplied 61, 31, and 8 percent respectively. The Banka smelter which was dismantled during World War II has not been rehabilitated. Exports of tin in concentrates were 31,209 long tons, of which 21,658 were shipped to the Netherlands, 9,514 tons to the United States, and 37 tons to Malaya.

232294—53——78

Malaya Federation.—In Malaya 1950 was a year of great prosperity in the tin industry. Tin reached the all-time record of $642 a picul. The tin industry faced the same problems as those confronting the rubber industry—Communist activity, increasing costs, and shortage of labor and European staff for supervision. Mine production of tin in ore was 57,537 long tons in 1950, compared with 54,910 in 1949, 84,082 in the peak year 1940, and an annual average of 55,309 per year during the prewar period 1935–39. An output of 5,176 tons was made in May 1950, the highest postwar rate, owing mainly to increased output from dredges. More dredges have been brought into operation, but some were closed down for periods to permit repairs and reconditioning after being in operation for more than 2 years. The output from Chinese-owned open-cast mines would have been greater had there been a sufficiency of electric power. During the year 47 mining properties resumed operation, bringing the total worked to 733 when the year closed. There were more than 1,000 before World War II. The labor force employed in tin mining had been increased from 46,993 during 1949 to 47,244 during December 1950.

Postwar Rehabilitation plans had called for 80 dredges and 550 gravel pumping mines to be in operation by the end of 1950. During 1950, the number of dredges increased from 76 at the beginning of the year to 80 in December to fulfill the goal. Dredges accounted for 28,005 long tons or 49 percent of the 1950 production.

The number of gravel-pumping mines had exceeded the planned goal, increasing from 518 at the beginning of the year to 561 in December 1950, with a production in the last month of 21,261 tons of tin, or 37 percent of the 1950 total. The following tabulation of the operations of about half the dredging output in Malaya indicates that in the postwar period the grade of gravel extracted was lower than in 1940–41.[11]

TABLE 19.—Production of tin concentrates by selected dredging companies in Malaya, 1940–41 (total), and 1948–50

	1940–41 (total)	1948	1949	1950
Number of companies	27	25	22	9
Material dredged ... 1,000 cubic yards	99,893	59,075	70,124	34,116
Tin recovered in concentrate:				
Total ... long tons	20,214	11,633	12,534	5,570
Per cubic yard ... pound	0.4533	0.4411	0.4004	0.3657

The principal source of pig tin in the world in 1950 was Malaya—from the large smelting plants of the Eastern Smelting Co., Ltd., Penang, and Straits Trading Co., Singapore. These plants increased their output 10 percent and supplied 40 percent of the world smelter production in 1950. Concentrates treated were derived mostly from Malaya, with smaller tonnages from Thailand, Burma, Indonesia, and French Indochina. The tin content of concentrates available from Malaya was 57,537 long tons compared with 55,448 in 1949. Imports originating elsewhere contained 9,912 tons of tin against 6,560 in 1949. The plants shipped 81,805 tons of metal (about 56 percent from Penang and 44 percent from Singapore). Nearly 54

[11] The International Tin Study Group, Notes on Tin; No. 6, June 1951, p. 105.

percent went to the United States in 1950. Stocks of tin metal decreased from 15,103 tons at the beginning of 1950 to 1,991 at the end, while stocks of tin in concentrates decreased from 5,222 at the beginning to 4,521 at the end.

Nigeria.—The Colony and Protectorate of Nigeria, including the Cameroons, under British trusteeship is the largest British possession in west Africa. The tin deposits are situated chiefly in the Northern Provinces—Plateau, Kabba, Niger, and Benue. Deposits currently worked are alluvial or eluvial and are mined by placer methods. Lode deposits are known to occur. Production of tin in concentrate in Nigeria totaled 8,258 long tons in 1950, a 6-percent decrease from 1949. Most of the world supply of columbium is produced as a byproduct of tin mining in Nigeria. All of the tin concentrates are sold to the United Kingdom. The Amalgamated Tin Mines of Nigeria, Ltd., which annually supplies about half of Nigeria's tin production, is developing the alluvial reserves reputedly lying beneath the basalts of the high plateau. On the success of this development depends prolongation of tin mining in Nigeria.

Portugal.—Production of tin in concentrates is estimated at 690 long tons in 1950, a 12-percent decrease from 1949. Exports of tin in concentrates to the United Kingdom totaled 702 long tons.[12] The shortage of electricity affected tin mining during the summer months. However, the relatively favorable price for tin compared with wolframite caused mines having reserves of both to increase the proportion of cassiterite during 1950. Mina da Panasqueria, the largest wolframite producer, was reported to have stoped cassiterite-rich areas and to be producing about 30 tons monthly. Operations of the Portuguese American Tin Co., working alluvial tin deposits in the Gaia Valley in the Beira Baixa district, were suspended. The dredge was dismantled and transported to a new gravel deposit in the Machainas Valley about 15 miles away. One [13] of the chief sources of Portuguese tin ore is the tributer and not the concession owner. Provided that the price per kilo for the crudely washed tin and wolfram concentrates is high enough to make collecting worth while, thousands of workers on the land, all experts in such work, are ready to exploit the localities known to them.[14]

Thailand.—Rehabilitation of dredges was virtually completed by the end of 1950. Production of tin in concentrates in 1950 totaled 10,364 long tons, a 33-percent increase compared with 1949. The number of dredges operating increased from 29 in January to 31 in December. The output of 1,004 long tons of tin in concentrates during October approached the prewar monthly average of 1,147 tons for the 1935–39 period. In 1950 production of tin in concentrate from dredges amounted to 6,628 long tons or 64 percent of total output; production from gravel pumps and hydraulicking amounted to 2,334 tons or 23 percent of total output. Production from other means and from dulang washing accounted for 967 tons or 9 percent and 435 tons or 4 percent, respectively, of the total output. Exports (reported as imports by receiving countries stated) of tin in concentrate were

[12] Bureau of Mines, Mineral Trade Notes, vol. 30, No. 5, May 1950, p. 23.
[13] Mining Journal (London), Annual Review Edition: May 1951, p. 121.
[14] Work cited in footnote 12.

10,585 long tons, of which 2,457 were shipped to the United States, 8,113 to Malaya, and 15 tons to Netherlands. The only mines that have not been able to produce since the end of the war were the Pinyok mine and the Talering mine. Thailand Tin Mines, Ltd., found financial and technical difficulties in finishing the Cavaet plant at the Pinyok mine, and Tonghah Harbour Tin Dredging, Ltd., had to cope with hard dredging ground and a fuel problem at Talering.[15]

United Kingdom.—The London Metal Exchange reopened for dealings in tin in mid-November. Starting at around £600 per ton in January, by mid-August the price had reached £847; after further upward fluctuations, £1,300 was reached in November, easing slightly to £1,290 at the end of the year. Mine production totaled 960 tons in 1950 compared with 1,212 tons in 1949. United Kingdom smelter production of tin was the third largest in the world in 1950. Output declined 4 percent compared with 1949. Year-end stocks of tin in concentrate were 2,250 tons (6,080 at beginning of year) and of metal 7,217 tons (14,682 at the beginning). Total stocks, including tin metal and concentrates afloat and visible consumers' stocks, were reported to be 12,800 tons at the end of 1950—a 45-percent decrease from 23,138 tons at the beginning of the year. Total virgin tin consumed was 22,850 tons, 10 percent above 1949. The use of tin for making tin plate, the principal finished product, was virtually unchanged from 1949. Requirements for solder were 49 percent greater than in 1949.

[15] Mining World, Apr. 15, 1951, p. 45.

Titanium

By Frank J. Cservenyak

GENERAL SUMMARY

DESPITE the great interest that has been aroused in development of titanium as a structural metal, titanium dioxide pigment continued, in 1950, to be the basis of the titanium industry. About 99 percent of the ilmenite production was consumed in this form.

New records were established in production of titanium pigments. This was accompanied by a production of 468,320 tons of ilmenite, also a new record.

Titanium metal was produced commercially on an increasing scale for the third successive year; commercial grades of high-strength titanium-base alloys were also available in 1950. The unique properties of titanium have aroused widespread interest and stimulated research on production and utilization of the metal and its alloys. In 1950, for the first time, titanium metal was offered to the market in a wide range of fabricated products, such as large plates, bar, forgings, tubing and wire, but producers of titanium sponge, ingot, and products were unable to meet the heavy demands for strategic and experimental applications.

The price of titanium sponge in 1950 was $5 per pound—equal to the price of aluminum 60 years ago or magnesium 45 years ago. It is to be expected that the price of titanium will decrease as the rate of production rises, as it has for aluminum and magnesium. At its present price the use of titanium is limited to such items as jet-engine parts, aircraft structures, and ordnance components, where the combination of lightness, strength, and corrosion resistance are important enough to justify the high cost.

Large-scale mining was started by the Quebec Iron & Titanium Corp. in the Allard Lake area of Quebec, Canada, reported to be the largest deposit of ilmenite in the world. Smelting operations on this ore were begun at Sorel; one electric furnace was in operation late in 1950. The high-titania slag from this operation is intended for export, principally to the United States, for production of pigments and metal. Although the price of this product will be higher than that of domestic and imported ores, its quality and uniformity are expected to be such as to command a higher price than the competing ores. This source assures the United States of an adequate supply of raw material for the industry for many years to come.

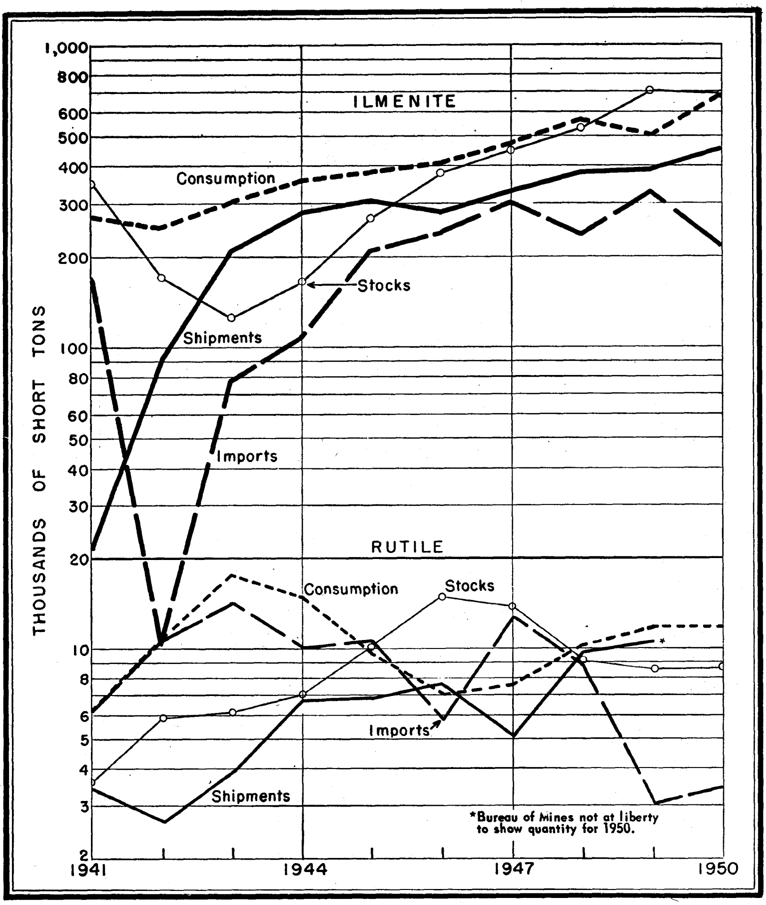

FIGURE 1.—Trends in domestic shipments, imports, consumption, and stocks of ilmenite and rutile, 1941–50

RESERVES

In his survey of the relative abundance of elements for the U. S. Geological Survey in 1924, F. W. Clarke found that titanium was the fourth most plentiful structural metal in the earth's crust, being exceeded only by iron, aluminum, and magnesium. However, only a few minerals bearing titanium are known to occur in bodies large enough to have economic importance. The principal minerals of titanium are rutile (TiO_2) and ilmenite ($FeTiO_3$); it also occurs as arizonite, titanite, and perovskite.

Titanium ores are found extensively throughout the United States, Canada, India, Australia, Norway, Ceylon, Brazil, Sweden, and the U. S. S. R. Large ilmenite deposits occur in Virginia and North Carolina. Extensive deposits of titaniferous iron ores occur in New York, Minnesota, Rhode Island, Wyoming, California, and New Mexico. Other occurrences of iron ores rich in titanium have been reported in North Carolina, South Carolina, Tennessee, New Jersey, Colorado, Montana, and Oklahoma. Rutile and ilmenite, with other minerals, are found in beach sands at many places along the Atlantic, Pacific, and Gulf coasts; they have been worked mainly in Florida and to some extent in Oregon. Rutile deposits also occur in Virginia and Arkansas.

The more significant publications issued up to January 1, 1950, on occurrence, exploration, mining, and treatment of titanium ores were listed in a bibliography prepared by the U. S. Geological Survey.[1]

The Magnet Cove rutile deposit, Hot Spring County, Ark., was explored by the Bureau of Mines; this work revealed an extension of the ore body from the previously mined area.[2]

Laboratory tests at the Bureau of Mines Experiment Station, Rolla, Mo., indicated that an ilmenite concentrate (about 20 percent TiO_2) and iron-ore concentrate could be recovered from the red mud or residue of the Hurricane Creek alumina plant operated by the Reynolds Metals Co.[3]

DOMESTIC PRODUCTION

Production of ilmenite in 1950 was 468,320 tons. Of the total, New York supplied more than one-half, Florida about one-fourth, and the remainder came from North Carolina and Virginia.

Both production and shipments of ilmenite increased 16 percent in 1950 and established new records for the fourth successive year. Ilmenite in 1950 includes a small quantity of mixed product containing altered ilmenite, leucoxene, and rutile. The mixed product was used in the manufacture both of titanium pigments and metal. The analysis of shipments of ilmenite ranged from 45 to 65 percent TiO_2; rutile shipments averaged 93 percent TiO_2.

TABLE 1.—Production and mine shipments of titanium concentrates from domestic ores in the United States, 1941–45 (average) and 1946–50, in short tons

Year	Ilmenite				Rutile			
	Production (gross weight)	Shipments			Production (gross weight)	Shipments		
		Gross weight	TiO_2 content	Value		Gross weight	TiO_2 content	Value
1941–45 (average)	178,236	183,189	83,098	$4,094,353	4,773	4,726	4,405	$694,730
1946	282,447	282,708	130,624	4,878,917	7,453	7,514	7,046	996,989
1947	336,533	336,061	157,328	5,029,490	8,562	5,157	4,813	533,548
1948	383,745	381,508	177,447	5,793,973	7,380	9,907	9,226	647,334
1949	402,334	389,234	186,535	6,212,348	[1] 11,988	[1] 10,559	[1] 9,414	[1] 489,798
1950	[1] 468,320	[1] 452,370	[1] 230,826	[1] 5,606,584	(2)	(2)	(2)	(2)

1 Includes a mixed product containing altered ilmenite, leucoxene, and rutile.
2 Bureau of Mines not at liberty to publish.

1 Carpenter, Jean Richards, and Luttrell, Gwendolyn Werth, Bibliography on Titanium (to January 1, 1950): U. S. Geol. Survey Circ. 87, 1951, 19 pp.

2 Reed, Donald F., Investigation of Magnet Cove Rutile Deposit, Hot Spring County, Ark.: Bureau of Mines Rept. of Investigations 4593, 1949, 9 pp.

3 Calhoun, W. A., Titanium and Iron Minerals from Black Sands in Bauxite: Bureau of Mines Rept. of Investigations 4621, 1950, 16 pp.

Important developments during 1950 included the formation of new titanium organizations. Rem-Cru Titanium, Inc., jointly owned by Remington Arms Co. and Crucible Steel Co. of America, was formed to make titanium and titanium-alloy products. National Lead Co. and Allegheny Ludlum Steel Corp. organized Titanium Metals Corp. of America to market and distribute titanium metal, its alloys, and various related products. Sharon Steel Corp. also announced that it was joining the ranks of steel companies going into the titanium-sheet business.

California.—A small quantity of ilmenite was produced at the property of the Ferro Titan Minerals Co., Sun Valley, Los Angeles County, Calif.

Florida.—The new operations of E. I. du Pont de Nemours & Co. at Starke, Fla., completed its first full year of operation. This property produced ilmenite and a mixed product containing altered ilmenite, leucoxene, and rutile.

Production of ilmenite and rutile in 1950 came again from the Rutile Mining Co. of Florida near Jacksonville. A small quantity of ilmenite and rutile was produced from the property of the Florida Ore Processing Co., near Melbourne, Fla., which was undergoing reorganization in 1950.

New York.—Production of ilmenite at Tahawus, Essex County, N. Y., by the National Lead Co. in 1950 was slightly below the peak production attained in 1949.

North Carolina.—The Yadkin Mica & Ilmenite Co., subsidiary of the Glidden Co., produced 26,543 tons of ilmenite (averaging 51 percent TiO_2) at Finley, Caldwell County, N. C., and shipped 25,843 tons. Production in 1950 was 15 percent under the record rate established in 1949.

Virginia.—Ilmenite was produced in 1950 at Piney River, Nelson County, Va., by the Calco Chemical Division of the American Cyanamid Co. Production at this property in 1950 increased about one-third over that in 1949.

CONSUMPTION AND USES

The consumption of ilmenite in 1950 was 33 percent higher than in 1949, establishing a new record of 679,244 tons. The manufacture of pigments again accounted for 99 percent of all ilmenite consumed. Rutile consumption in 1950 increased mainly in welding-rod coatings and alloys and carbide. Rutile consumption reported in 1949 included a mixed product containing altered ilmenite, leucoxene, and rutile; this product is included with ilmenite for 1950.

TABLE 2.—Consumption of ilmenite and rutile in the United States, 1942–47, total, and 1948–50, by products, in short tons

Product	Ilmenite		Rutile	
	Gross weight	Estimated TiO_2 content	Gross weight	Estimated TiO_2 content
1942	257, 535	141, 412	10, 616	9, 952
1943	302, 822	142, 868	17, 634	16, 451
1944	360, 941	175, 475	14, 813	13, 837
1945	381, 178	187, 580	9, 791	9, 144
1946	404, 283	202, 663	7, 134	6, 670
1947	479, 524	250, 859	7, 692	7, 083
1948				
Pigments (manufactured titanium dioxide)[1]	558, 448	297, 728	([2])	([2])
Welding-rod coatings [1]	145	72	7, 885	7, 289
Alloys and carbide	6, 377	2, 591	952	889
Ceramics			175	166
Miscellaneous	30	17	[3] 1, 218	[3] 1, 144
Total	565, 000	300, 408	10, 230	9, 488
1949				
Pigments (manufactured titanium dioxide)[1]	505, 432	265, 854	([2])	([2])
Welding-rod coatings [1]	165	85	6, 399	5, 904
Alloys and carbide	4, 969	2, 037	660	619
Ceramics			143	136
Miscellaneous	42	24	[4] 4, 686	[4] 4, 204
Total	510, 608	268, 000	[4] 11, 888	[4] 10, 863
1950				
Pigments (manufactured titanium dioxide)[1] [4]	671, 335	347, 747	([2])	([2])
Welding-rod coatings [1]	210	106	9, 218	8, 516
Alloys and carbide	7, 666	3, 803	1, 454	1, 366
Ceramics			195	185
Miscellaneous	33	19	854	802
Total	679, 244	351, 675	11, 721	10, 869

[1] "Pigments" include all manufactured titanium dioxide, consumption of which in welding-rod coatings was 1,338 tons in 1948, 1,082 tons in 1949, and 1,439 tons in 1950.
[2] Included in "Miscellaneous," in order to avoid disclosure of individual company operations.
[3] Includes rutile used to make pigments.
[4] Includes a mixed product containing altered ilmenite, leucoxene, and rutile used to make pigments and metal.

Titanium Pigments.—Production and shipments of titanium pigments were 18 and 21 percent, respectively, above previous peaks in 1948. Figures in this industry are supplied in confidence and consequently are not given here. The percentage distribution of titanium pigment shipments, by consuming industries, is shown in table 3.

TABLE 3.—Distribution of titanium pigment shipments, by industries, 1935–45 (average) and 1946–50, in percent of total

Industry	1935–45 (average)	1946	1947	1948	1949	1950
Distribution by gross weight:						
Paints, varnishes, and lacquers	77.7	78.6	81.5	76.4	74.5	74.5
Floor coverings (linoleum and felt base)	2.5	2.5	3.7	4.5	4.6	4.2
Coated fabrics and textiles (oilcloth, shade cloth, artificial leather, etc.)	3.0	1.8	2.1	2.1	1.6	1.5
Rubber	2.5	2.0	2.6	2.5	3.1	3.0
Paper	6.8	6.1	5.5	5.4	6.6	6.2
Printing ink	1.0	.9	.9	.9	.9	.9
Other	6.5	8.1	3.7	8.2	8.7	9.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Distribution by titanium dioxide content:						
Paints, varnishes, and lacquers	68.8	71.9	74.3	69.9	67.5	66.9
Floor coverings (linoleum and felt base)	3.9	3.1	4.7	5.9	5.8	5.2
Coated fabrics and textiles (oilcloth, shade cloth, artificial leather, etc.)	3.7	2.3	2.6	2.7	2.1	2.0
Rubber	2.9	2.8	3.4	3.2	3.9	3.9
Paper	9.9	8.6	7.8	7.4	9.6	9.1
Printing ink	1.7	1.5	1.5	1.4	1.4	1.4
Other	9.1	9.8	5.7	9.5	9.7	11.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Metal.—Titanium metal was produced on a commercial basis for the third successive year. Pilot plants were operated in 1950 by E. I. du Pont de Nemours & Co. at Newport, Del., and by the National Lead Co. at Sayreville, N. J. The Bureau of Mines pilot plant at Boulder City, Nev., produced 13,810 pounds of titanium sponge in 1950 giving a total of 34,000 pounds of metal produced at this plant since 1945.

The nominal annual capacity of all titanium pilot plants in operation in 1950 was 300,000 pounds; however, production of metal was only about 50 percent of this amount because the pilot plants were operated experimentally and did not produce continuously at designed capacity.

At the end of 1950, E. I. du Pont de Nemours and National Lead were both considering substantial expansions. Du Pont started construction of a commercial plant with a nominal capacity of 600 tons per year and was considering additional expansion in 1951. National Lead leased several buildings at the Henderson, Nev., site of the former Basic Magnesium, Inc., plant and announced plans for expanded production of titanium, as well as the magnesium to be used as a reducing agent in titanium production.

Commercially pure titanium metal (approximately 99.5 percent Ti) was offered in limited quantities in a wide range of products, such as large sheets, strip, plate, bar, forgings, tubing, and wire. Titanium ingots weighing 500 pounds were produced during 1950, and production of larger ingots was reported at the end of the year. Producers of titanium sponge, ingot, and products could not meet the heavy demands for strategic and experimental applications.

Titanium powder, 96–98 percent Ti, was produced by Metal Hydrides Inc., Beverly, Mass. This plant also produced cast titanium suitable for addition to nonferrous alloys, titanium hydride for powder metallurgy and chemical reactions, and titanium master alloys in powder and ingot form.

The Foote Mineral Co., Philadelphia, Pa., and New Jersey Zinc Co., Palmerton, Pa., produced small quantities of high-purity ductile titanium 99.9+ percent Ti, by thermal decomposition of volatile titanium iodides. This metal is used primarily for obtaining fundamental information on the properties of titanium and its alloys. The high-purity metal is costly and was not available in commercial quantities in 1950.

Welding-Rod Coatings.—Production of titanium-coated welding rods was 188,000 short tons in 1950, an increase of 22 percent over the 154,000 short tons in 1949; 188,000 tons were coated in 1948, 153,000 in 1947, and 481,000 tons in 1943. Of the 1950 tonnage, 55 percent was coated with natural rutile, 32 percent with manufactured titanium dioxide, 7 percent with both varieties, and 6 percent with ilmenite.

Other Uses.—Ceramic titanates are finding an increasingly important place in the electronic industry. Barium titanate and solid solutions of barium and strontium titanates have exceptionally high dielectric constants and show remarkable piezoelectric effects. The biggest field of application is in capacitors for television sets where compactness is of great value. They are also used for phonograph pick-ups, microphones, and high-frequency sound generators. Titanate ceramic radiators for production of ultrasonic energy may find new uses in application of ultrasonic radiation to chemical processes.[4]

The use of titanium dioxide as the major opacifying agent in porcelain enamels is finding increased application for stoves, refrigerators, signs, reflectors, architectural products, sanitary ware, and hollow ware. The chief advantages of titania enamels are their superior opacity or hiding power, extreme hardness, and excellent acid resistance.[5]

Titanium compounds have been used experimentally as fire-retardant agents for fabrics. A titanyl chloride-antimony trichloride complex, found to be effective in providing flame retardancy, has been applied to many types of cellulose fabrics.[6]

The alkyl titanates, derived from the action of titanium tetrachloride on alcohols, were reported to be very effective waterproofing agents. These compounds can impart a water-repellent finish to such diverse materials as paper, cotton, wool, rayons, nylon, silk, felt, and wood. Potential industrial applications depend on the commercial availability of these compounds at a reasonable cost.[7]

Clear, transparent rutile gems were available in 1950. Large boules were produced by fusing purified titanium dioxide in an electric furnace. Gems cut from these boules exhibit brilliance equal to that of diamonds. Rutile gems are only seven-tenths as hard as diamonds but have an index of refraction of 2.7 compared to 2.41 for diamonds, which means a higher degree of internal reflection.

The numerous uses of titanium in steels and alloys were discussed in detail in a text published in 1949.[8]

---

[4] Jaffe, Hans, Titanate Ceramics for Electromechanical Purposes: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 264–268.

[5] Spencer-Strong, G. H., and Patrick, Robt. F., Titanium in Porcelain Enamels: Ind Eng. Chem., vol. 42, No. 2, February 1950, pp. 253–256.

[6] Panik, I. M., Sullivan, W. F., and Jacobsen, A. E., Titanium Compounds as Fire-Retardant Agents for Fabrics: American Dyestuff Reporter, vol. 39, Aug. 7, 1950, pp. 509–516.

[7] Speer, Robt. J. and Carmody, D. R., Organic Compounds of Titanium: Ind. Eng. Chem., vol. 42, No. 2, Feburary 1950, pp. 251–253.

[8] Comstock, G. F., Urban, S. F., and Cohen, M., Titanium in Steel: Pitman Publishing Co., 1949, 320 pp

STOCKS

Inventories of ilmenite in 1950 decreased slightly, and those of rutile reflected little change from 1949. Year-end stocks of ilmenite and rutile (TiO_2 content basis) were sufficient to sustain industry at the 1950 rate of use for 11 months and 9 months, respectively.

TABLE 4.—Stocks of titanium concentrates in the United States at end of year, 1949–50, in short tons

Stocks	1949				1950			
	Ilmenite		Rutile		Ilmenite		Rutile	
	Gross weight	Estimated TiO_2 content	Gross weight	Estimated TiO_2 content	Gross weight	Estimated TiO_2 content	Gross weight	Estimated TiO_2 content
Mine	16,933	7,569	2,952	2,750	32,883	15,240	3,810	3,543
Distributors [1]	[2] 158	[2] 92	[2] 2,071	[2] 1,967	172	100	2,216	2,113
Consumers	[2] 681,757	[2] 331,483	[2] 3,591	[2] 3,355	649,203	318,862	2,653	2,466
Total	[2] 698,848	[2] 339,144	[2] 8,614	[2] 8,072	682,258	334,202	8,679	8,122

[1] Includes ilmenite and rutile content of mixed zirconium-titanium concentrates.
[2] Revised figure.

PRICES

Ore.—Quotations in E&MJ Metal and Mineral Markets covering ilmenite were unchanged in 1950. Nominal quotations for 56–59 percent TiO_2, per gross ton, f.o.b. Atlantic seaboard, according to grade and impurities, remained at \$14–\$16. Nominal quotations for rutile concentrate, guaranteed minimum 94 percent TiO_2, were 4–5 cents a pound until April 1950, when they dropped to 3½–4½ cents for the rest of the year.

Ferrotitanium.—According to the magazine Steel, quotations for ferrotitanium during the first 5 months of 1950 were as follows:

Ferrotitanium, Low-Carbon: (Ti 20–25 percent, Al 3.5 percent maximum, Si 4 percent maximum, C 0.10 percent maximum). Contract, ton lots, 2″ x D, \$1.40 per pound of contained Ti; less ton \$1.45. (Ti 38–43 percent, Al 8 percent maximum, Si 4 percent maximum, C 0.10 percent maximum). Ton lot \$1.28 less ton \$1.35, f. o. b. Niagara Falls, N. Y., freight allowed to St. Louis. Spot add 5¢.

Ferrotitanium, High-Carbon: (Ti 15–18 percent, C 6–8 percent). Contract \$160 per net ton, f. o. b. Niagara Falls, N. Y., freight allowed to destination east of Mississippi River and north of Baltimore and St. Louis.

Ferrotitanium, Medium-Carbon: (Ti 17–21 percent, C 3–4.5 percent). Contract, \$175 per ton, f. o. b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

Quotations for low-carbon ferrotitanium continued for the remainder of the year at $1.40 and $1.45 per pound of contained Ti, respectively, for ton and less-than-ton lots. Quotations for high-carbon ferrotitanium increased to $167 per net ton in June, continuing at that level for the remainder of the year. Quotations for medium-carbon ferrotitanium increased to $183 per ton in June also with no further change reported during the remainder of 1950.

Metal.—Titanium metal, 96–98 percent, was quoted at $5 a pound during 1950. Titanium sponge metal (titanium 99.5 percent minimum, iron 0.25 percent maximum, nitrogen 0.05 percent maximum) was quoted by E. I. du Pont de Nemours & Co., Pigments Department, Wilmington, Del., at $7.50 per pound in quantities of less than 100 pounds and $5 per pound in quantities of 100 pounds or more, all prices f.o.b. shipping point. Titanium Metals Corp. of America, New York, N. Y., announced the following prices for titanium metal, commercially pure and alloy grades, in October 1950: Base prices per pound in lots of 10,000 pounds and over in commercially pure and alloy grades f.o.b. mill: Hot and cold-rolled sheets, $15, Brackenridge, Pa.; hot-rolled sheared mill plate, $12, Brackenridge; cold-rolled strip, $15, West Leechburg, Pa.; rolled or cold-drawn round bar in small diameters and round wire, $10, Dunkirk, N. Y.; forgings (rounds, disks, and round-cornered squares and rectangles), $6, Watervliet, N. Y.; hot-rolled bars (rounds, flats, and squares), $6, Watervliet.

Manufactured Titanium Dioxide.—Prices, in cents per pound, for manufactured titanium dioxide (anatase) as quoted by Oil, Paint and Drug Reporter for the first 11 months of 1950 were listed as follows: Ceramic, 19½ cents; chalk-resistant, 19½ cents; plain, 19½ cents; and (rutile) nonchalking, 21½ cents. These prices were for carlots, in bags, delivered. In December quotations were increased on all grades. The ceramic and chalk-resistant grades were quoted at a range of 21–21½ cents and (rutile) nonchalking at 23–23½ cents. The plain grade was not shown in the December quotations; however, a "regular" grade was added at 21–21½ cents.

FOREIGN TRADE [9]

Imports.—Receipts of ilmenite in 1950 were 216,459 tons, 33 percent less than the record established in 1949; this is the lowest since 1945. Imports from India, the dominant source, dropped 35 percent; those from Norway dropped 18 percent. India supplied 87 percent and Norway, the second most important source, 13 percent of the 1950 total.

All imports of rutile were from Australia for the third successive year and totaled 3,427 tons, 11 percent above 1949.

[9] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 5.—Titanium concentrates[1] imported for consumption in the United States, 1941–45 (average) and 1946–50, by countries, in short tons

[U. S. Department of Commerce]

Country of origin	1941–45 (average)	1946	1947	1948	1949	1950
ILMENITE						
Australia[2]	564		1,659	(3)		112
Brazil	4,203	2	1	8,708		
Canada	23,054	1,250	7,122	4,519	540	1,357
Ceylon	930				2	
Egypt					721	
France						1
India	81,592	218,623	262,503	184,309	289,739	187,834
Malaya				3,335		
Norway	1,979	21,077	30,026	41,248	33,155	27,155
Portugal	194					
Total as reported	112,516	240,952	301,311	242,119	324,157	216,459
Australia: In "zirconium ore"[2]	[4] 3,126	1,388				
Grand total	115,642	242,340	301,311	242,119	324,157	216,459
Value of "as reported"	$576,793	$1,440,112	$1,791,020	$1,758,848	$2,479,071	$1,198,545
RUTILE						
Australia[2]	1,949	4,377	7,460	8,771	3,085	3,427
Brazil	2,848	31				
French Cameroon[5]	248		3			
India	190		113			
Norway				(3)		
Total as reported	5,235	4,408	7,576	8,771	3,085	3,427
Australia:[2]						
In "zirconium ore"	5,120	1,456				
In "ilmenite"			5,061			
Grand total	10,355	5,864	12,637	8,771	3,085	3,427
Value of "as reported"	$424,834	$213,795	$468,810	$588,713	$179,746	$149,733

[1] Classified as "ore" by the U. S. Department of Commerce.
[2] Most of the imports of titanium from Australia in 1940–47 were in mixed zircon-rutile-ilmenite concentrates, which were included as ilmenite, rutile, and zirconium ore in U. S. Department of Commerce figures. The quantities reported by the U. S. Department of Commerce have been adjusted to reflect percentage content of each item based on reports to the Bureau of Mines from importers.
[3] Less than 0.5 ton.
[4] Includes 309 tons not recovered from mixed concentrates.
[5] Includes quantities reported by the U. S. Department of Commerce as originating in French Equatorial Africa, from which no rutile production has been recorded.

Exports.—Shipments of titanium pigments from the United States again established a new high level in 1950. As in previous years, titanium pigments constituted the major portion of exports of titanium materials. Canada continued to be the chief recipient with 24,450 tons, followed by Mexico with 1,579 tons, France 1,308, Brazil 1,062, Cuba 737, Belgium-Luxembourg 601. The remainder was distributed among 41 other countries. Exports of concentrates were the lowest since 1944 with Canada receiving 435 tons, Argentina 67, Netherlands 55, and eight other countries the remainder. Canada received 137 tons of the ferro-alloys exported and Belgium-Luxembourg 24; insignificant quantities went to four other countries.

TABLE 6.—Exports of titanium products from the United States, 1943–45 (average) and 1946–50, by classes

[U. S. Department of Commerce]

Year	Concentrates		Ferro-alloys		Dioxide and pigments		Tetrachloride and other compounds	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1943–45 (average)	492	$92,575	[1] 766	[1] $122,478	11,171	$1,999,118	393	$235,00)
1946	1,385	200,866	550	63,723	16,314	3,092,607	(2)	(2)
1947	1,266	192,703	509	80,590	21,171	5,183,936	(2)	(2)
1948	1,454	187,225	480	82,874	26,824	7,126,956	(2)	(2)
1949	1,505	143,412	179	40,918	29,621	8,140,991	(2)	(2)
1950	600	57,753	171	42,741	32,660	8,799,758	(2)	(2)

[1] Includes metal and nonferrous alloys in 1943–44.
[2] Beginning Jan. 1, 1946, not separately classified.

TECHNOLOGY

Metallic titanium owes its importance to an unusual combination of properties—lightness, strength, and resistance to corrosion. The density of titanium is 0.16 pound per cubic inch, 60 percent heavier than aluminum but only 56 percent as heavy as alloy steel. Titanium alloys are much stronger than aluminum alloys, having tensile strength and hardness approaching that of many alloy steels. The strength : weight ratio at ordinary temperatures exceeds that of either aluminum or stainless steel. Titanium alloys also have unusual resistance to fatigue and great impact strength. Titanium metal is more resistant to corrosion than aluminum and is as resistant as stainless steels; it is particularly resistant to sea-water corrosion and marine atmospheric weathering.

The chief disadvantages are high cost, difficulties of fabrication and its excessive reactivity at high temperatures. Although the melting point of titanium—3,150° F.—is extremely high, it absorbs oxygen and nitrogen and becomes brittle above 1,000° F.

Commercial production of titanium metal in 1950 was based on modifications of the Kroll process developed by the Bureau of Mines. Titanium tetrachloride, produced by chlorination of titanium ores, is reduced to the metallic state with magnesium in an inert atmosphere. Magnesium chloride and excess magnesium are removed from the sponge-like titanium metal by vacuum distillation. The titanium sponge or powder is consolidated by powder metallurgy techniques or melted in induction or electric-arc furnaces.[10]

A continuous method of producing titanium employing magnesium and titanium tetrachloride as the raw materials was proposed by the Battelle Memorial Institute in 1950. Liquid magnesium is continuously added to a titanium tetrachloride atmosphere in a reduction chamber to produce magnesium chloride and titanium at 1,400°–1,600° F. The reaction product runs continuously from the bottom of the reduction chamber into an arc furnace, where the titanium is melted and the magnesium chloride and unreacted

[10] Wartman, F. S., Walker, J. P., Fuller, H. C., Cook, M. A., and Anderson, E. L., Production of Ductile Titanium at Boulder City, Nevada: Bureau of Mines Rept. of Investigations 4519, 1949, 37 pp.

magnesium are volatilized, condensed, and removed. A continuously formed titanium ingot is withdrawn from the bottom of the furnace.[11]

Other processes under consideration include electrolytic reduction, use of mixtures of sodium and magnesium as reducing agents, reaction of titanium tetrachloride vapors and hydrogen in an arc, and improved iodide decomposition processes.[12]

The year 1950 was notable for increased interest in titanium technology.[13] Extensive research was in progress in 1950 on high-strength titanium-base alloys. Rem-Cru Titanium, Inc., developed and sold manganese and manganese-aluminum titanium alloys,[14] and the Titanium Metals Corp. of America offered chromium titanium alloys.[15] The Navy Bureau of Aeronautics reported development of a lightweight chromium-aluminum titanium alloy as strong as high-strength steel.[16]

A general description of the process presumably to be used on Allard Lake titaniferous ore at the Quebec Iron & Titanium Corp. smelting project at Sorel, Canada, was reported in a patent issued to that firm.[17] The process marks a new approach to the smelting of titaniferous ore. Previously the titanium and iron have been separated by a combination of ore dressing and normal smelting processes. Large amounts of flux were added to produce fluid slags and permit separation from the iron. The process used by Quebec Iron & Titanium Corp. utilizes little or no flux to give a titanium-rich slag of about 70 percent TiO_2 suitable for further processing and also a marketable iron product. A proportioned charge of ore, coal and 0 – 10 percent of lime for fluxing is smelted at 1,500° to 1,700° C. in a stationary box-shape electric furnace. Low-ash coal, ranging from 8 to 14 percent of ore weight, slightly less than stoichiometric requirements to reduce the iron oxide and to carburize the iron, is included in the charge. Ores reported to be suitable for producing titanium-slag concentrate are those with titanium dioxide content of 30 to 50 percent, iron 30 to 50 percent, and gangue up to 12 percent.

A chemical technique was devised by the Bureau of Mines for utilizing certain domestic titaniferous iron ores. Ninety percent of the iron in Tahawus magnetite was recovered experimentally as an iron powder analyzing 90 percent metallic iron and containing 2 to 3 percent TiO_2. The titania remains in the slag, from which it may be recovered as pigment-grade TiO_2. The main steps are (1) sintering

[11] Maddex, P. J., and Eastwood, L. W., Ductile Titanium: Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 188, No. 4, April 1950, pp. 634–640.

[12] Gonser, Bruce W., Titanium: Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 1, No. 1, sec. 1, January 1949, pp. 6–9.

[13] Industrial and Engineering Chemistry, Titanium Symposium: Vol. 42, February 1950, pp. 214–268.
Analytical Chemistry, Titanium Symposium: Vol. 22, February 1950, pp. 297–303.
Broughton, D. B., Less Common Metals: Ind. Eng. Chem., vol. 42, No. 10, October 1950, pp. 2023–2026.
U. S. Research and Development Board, Symposium on Titanium: PB 103564, November 1950, 108 pp. (Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.)
Gonser, Bruce W., Titanium Alloys: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 222–226.
Craighead, C. M., Simmons, O. W., and Eastwood, L. W., Titanium Binary Alloys, Titanium Ternary Alloys, Titanium Quaternary Alloys: Am. Inst. Min. and Met. Eng., Jour. Metals, vol. 188, No. 3, March 1950, pp. 485–552.

[14] Allen, A. H., Titanium—How it Fits in Your Tomorrow: Steel, vol. 128, No. 2, Jan. 8, 1951, pp. 54–82.

[15] Anthony, John, Alloys Widen Use of Titanium: Iron Age, vol. 166, No. 4, July 27, 1950, pp. 60–62.

[16] P. R. Mallory Co. (for Bureau of Aeronautics). The Manufacture of Titanium Alloys: PB 100,000, November 1949. Library of Congress, Photoduplication Service, Publications Board Project, Washington, D. C.

[17] Peirce, W. M., and others, Titaniferous Material for Producing Titanium Dioxide: United States Patent 2,476,453, July 19, 1949.

the ore at 1,050° C. with carbon and soda ash to reduce the iron to metal powder, retaining the titania in the slag; (2) separating the powdered iron from the slag, by magnetic or gravity separating methods; and (3) sulfuric-acid decomposition of the slag fraction to recover the titania.[18]

WORLD REVIEW

World production of ilmenite and rutile both established new peak records in 1950. The world production of ilmenite was estimated at 788,000 metric tons, an increase of 8 percent over 1949. Rutile production, estimated at 25,600 metric tons, increased 7 percent over 1949.

The United States continued to be the world's largest producer of ilmenite, supplying about one-half of the ilmenite produced in 1950. Australia again ranked first in the production of rutile.

Available data on world production of ilmenite and rutile in recent years are shown in table 7.

TABLE 7.—World production of titanium concentrates (ilmenite and rutile), 1944–50, by countries, in metric tons.

[Compiled by Pauline Roberts]

Country	1944	1945	1946	1947	1948	1949	1950
ILMENITE							
Australia:							
New South Wales	3,590	2,485	1,636	[1] 3,551	[1] 7,489	[1] 5,958	[1 2] 7,600
Queensland	3,697	4,186	4,258	[1] 2,934	[1] 4,318	[1] 4,063	[1 2] 4,800
Tasmania				844			(3)
Western Australia						73	85
Brazil	3,250	[4] 5,000			[4] 7,900	650	(3)
Canada	30,820	12,834	1,275	6,445	4,029	490	[5] 2,585
Egypt	9	46	146		1,601	635	260
India	102,412	174,848	187,993	265,143	233,098	226,816	216,076
Malaya				[4] 13,291	12,909	20,034	25,315
Norway	63,975	28,312	52,574	69,711	90,017	99,013	105,000
Portugal		301	633	243	155	680	47
Senegal		3,200	4,191	11,282	3,690	8,338	788
Spain	548	216	128	150	181	376	637
United States	252,749	279,880	256,230	305,296	348,126	364,989	424,851
Total ilmenite	461,050	511,308	509,064	678,890	713,513	732,115	[2] 788,000
RUTILE							
Australia:							
New South Wales	4,597	5,292	4,876	9,068	[1] 7,110	[1] 7,466	[1] 10,753
Queensland	4,246	4,609	3,407	4,338	[1] 6,411	[1] 5,149	[1] 7,853
Brazil	1,564	[4] 160	[4] 28	[4] 5			(3)
French Cameroon	3,320	1,440	1,260	755	576	403	25
French Equatorial Africa							6
India	1,672	620	262	160	129		(3)
Norway	85	76	63	51		16	(3)
United States	6,279	6,513	6,761	7,767	6,695	10,875	(6)
Total rutile	21,763	18,710	16,657	22,144	20,921	23,909	[2] 25,600

[1] Excludes content of beach sand in stock dumps.
[2] Estimate.
[3] Data not available; estimate included in total.
[4] Exports.
[5] Includes titanium slag containing approximately 70 percent TiO_2.
[6] Bureau of Mines not at liberty to publish figure.

[18] MacMillan, Robert T., Dinnin, Joseph I., and Conley, John E., Proposed Process for Treatment of Low-Grade Titaniferous Ores: Bureau of Mines Rept. of Investigations 4638, 1950, 19 pp.

Australia.—The Australian Titan Products Pty., Ltd., a subsidiary of British Titan Products Co., Ltd., operated its new titanium-pigment plant near Burnie, Tasmania, in 1950.[19] This plant, with an annual capacity of 1,800 tons of titanium oxide, was completed in 1949. Plans to double plant capacity by installation of new equipment were completed in the latter part of 1950.[20] The titanium pigment has found a ready market in the Australian paint, enamel, rubber, soap, cosmetics, paper, and textile industries. Indian ilmenite was used as a raw material. Although Australia produces large amounts of ilmenite concentrate as a byproduct in the recovery of zircon and rutile from black sands, it is unsuitable for pigment manufacture because of its high chromite content, which ranges from 1 to 4 percent. Research on separation of chromite was in progress in 1950.

Canada.—The Allard Lake ilmenite property is being developed by the Quebec Iron & Titanium Corp., owned two-thirds by the Kennecott Copper Corp. and one-third by the New Jersey Zinc Co. The several basic operations consist of (1) mining the extensive ilmenite deposits in the Allard Lake district of the Quebec North Shore, north of Anticosti Island, (2) transportation, by company-owned railroad, to the docking and loading facilities at Havre St. Pierre, (3) precrushing and preparation of the ore at Havre St. Pierre, and (4) transportation by ship up the St. Lawrence to the smelter at Sorel. Mining operations eventually will center at the Lac Tio deposit, which is reported to contain more than 125 million tons and to be the largest deposit of its kind in the world. It is estimated that reserves, thus far proved, constitute 225 years' supply at the treatment rate of 1,500 tons per day. The grade of the ore is 35–36 percent TiO_2 and 40–42 percent Fe. Ore for the initial smelting operations was obtained from a small ore body near Grader Lake, 2 miles south of the main deposit, because it was near the railroad.

The mine will be operated for about 7 months, during the open shipping season. Enough ore will be mined, transported, and stockpiled during this period to feed the smelter on a year-round basis. Ore was being shipped from Grader Lake in October 1950 at the rate of three trainloads (570 tons each) daily. Approximately 100,000 tons of ore were delivered to Sorel in 1950. This will be ample for smelter operations beyond the time when navigation reopens in the spring of 1951. The railroad to Havre St. Pierre, 27 miles long, was completed near the end of 1950.

A temporary crushing plant has been built near the loading dock at Havre St. Pierre, pending construction of a permanent larger plant at Lac Tio. Loading facilities can handle from 2,000 to 2,800 tons per hour, and a 10,000-ton freighter can be loaded in 10 hours.

One 750-ton, 20,000-kw. furnace has been installed from which experimental tappings were made. Plans call for installation of four additional furnaces, starting in the spring of 1951. It is planned to

[19] Chemical Engineering, vol. 57, No. 4, April 1950, p. 234.
[20] Chemical Engineering and Mining Review, vol. 43, No. 1, Oct. 10 1950. p. 19

build and maintain a stockpile of approximately one-half million tons of prepared ore. A contract has been negotiated with the Shawinigan Water & Power Co. for 165,000 hp. to be delivered at an ascending rate as production gets under way.

Coproducts will be titanium dioxide slag (70 percent TiO_2) and iron, with ultimate annual production of 250,000 and 175,000 tons, respectively, from 550,000 tons of ore. According to the management, the company product will be competitive with Indian ilmenite. Although the price will be higher than for other TiO_2-bearing compounds, the concentration, quality, and uniformity are expected to be such that the product will be able to command this higher price. All or nearly all of the production is intended for export, principally to the United States. The iron product, as described by the company, will be too low in carbon to be classed as pig iron and, unless or until alloyed, cannot be properly classified as steel. It has been referred to as "non-specification steel," and Canadian steelmakers have shown some interest in it as a possible source of No. 1 Heavy Melt scrap. It is understood the company plans to market its entire ferrous output domestically. No information was forthcoming on company plans for eventual production of titanium metal although it reports that both Kennecott and New Jersey Zinc are experimenting along this line.[21]

Dominion Magnesium is producing titanium powder and sintered compacts for use in high-temperature alloy and stainless steel at its pilot plant at Haley, Ontario. Although titanium with a purity of 98.5 to 99 percent plus was obtainable, consistent production of ductile titanium metal has not yet been reported.

Ceylon.—Consideration has been given for a number of years to the production of ilmenite from extensive beach sands in Ceylon. It was reported that provision was made in the Ceylon Budget for establishing an ilmenite milling plant, probably at Pulmoddai, about 40 miles from Trincomalee on the east coast.[22] According to the government mineralogist, the sands contain about 70 percent ilmenite, 12 percent rutile, and 8 percent zircon.[23] Ceylon authorities hope to produce 60,000 tons of ilmenite (about 54 percent TiO_2) annually.

India.—Exports of ilmenite from India to the United States dropped from 289,739 short tons in 1949 to 187,834 short tons in 1950. The production of ilmenite has been greatly hampered by labor difficulties since the government took over the ilmenite companies.

A plant for the production of titanium pigments was under construction by the Travancore Titanium Products Co. in 1950. As this plant will consume only about 3,600 tons of ilmenite per year, it appears that India will continue to be a large exporter of ilmenite. Before the 1950 shipping season, India invited American importers and buyers to submit inquiries concerning the availability of ilmenite and rutile.[24]

---

21 Cross, Cecil M. P., Progress Report on the Quebec Iron & Titanium Corp. Project: Consular Rept., American Embassy, Montreal, Canada, Oct. 25, 1950, 5 pp.
22 Canada Mining Journal, Ilmenite in Ceylon: Vol. 71, No. 3 March 1950, p. 84K.
23 Foreign Commerce Weekly, vol. 38, No. 2, Jan. 9, 1950, p. 27.
24 Foreign Commerce Weekly, vol. 37, No. 10, Dec. 5, 1949, p. 13.

Japan.—The Nippon Titanium Co., under joint American and Japanese sponsorship, was formed in 1950 to manufacture titanium dioxide. The company reported that Japanese ore will be treated by a process developed by Dr. Kyozo Ariyama, a graduate of the University of Minnesota.[25]

United Kingdom.—The National Physical Laboratory and Royal Aircraft Establishment conducted research on titanium phase diagrams, analytical methods, alloys, thermodynamics, and production processes. Reduction of titanium tetrachloride with hydrogen, electrolytic, and new electrothermic processes for producing titanium metal were under consideration.

[25] The Chemical Age, Japanese Titanium Oxide: Vol. 63, No. 1628, Sept. 23, 1950, p. 441.

Tungsten

By Robert W. Geehan

GENERAL SUMMARY

INCREASED demand for tungsten products early in 1950 reversed the downward trend of both consumption and production of concentrates. Later in the year, following the outbreak of fighting in Korea, consumption increased substantially, and international bidding for tungsten concentrates forced the price up to a level higher than at any time since World War II. Shipments of Class A (1.8 to 6 percent W) and Class B (19 to 22 percent W) high-speed steels increased 163 and 58 percent, respectively, compared with those in 1949. Domestic producers of tungsten concentrates could not increase production at a rate that would have corresponded to the increased demand; however, domestic production increased nearly 40 percent over 1949, and in the fourth quarter of 1950 production was over twice as high as in the corresponding quarter of 1949. California was again the premier tungsten-producing State, followed by North Carolina and Nevada. The Pine Creek mine of United States Vanadium Corp. rose to first place among United States producers of tungsten concentrates in 1950. The Nevada-Massachusetts Co., which suspended operations in 1949, resumed production in 1950, and production from its Mill City, Nev., plant was an important factor in the increased domestic output.

TABLE 1.—Salient statistics of tungsten ores and concentrates in the United States, 1946–50, in pounds of contained tungsten

Year	Production	Shipments from mines	Imports for consumption	Consumption	Industry stocks at end of year		
					Producers	Consumers and dealers	Total
1946	4,671,042	4,942,282	6,869,438	6,458,000	285,865	3,694,256	3,980,121
1947	3,026,470	2,944,622	6,018,005	7,812,000	368,316	3,343,392	3,711,708
1948	4,033,389	3,838,287	7,548,101	8,853,000	563,418	5,284,901	5,848,319
1949	2,896,084	2,631,506	6,274,102	4,958,000	827,045	4,229,444	5,056,489
1950	3,965,040	4,587,687	16,147,313	6,597,000	216,468	5,121,206	5,337,674

Imports of tungsten ores and concentrates for consumption were also larger than in 1949, totaling 16,966 short tons (60-percent WO_3 basis), an increase from 6,592 tons in 1949. However, these data are somewhat misleading because of large withdrawals from bonded warehouses by the United States Government, which are classified as imports for consumption. A more accurate picture of the increase in imports is obtained from the "general import" statistics, which indicate 8,765 tons for 1950 contrasted with 7,731 tons in 1949, both based on 60-percent WO_3. In spite of hostilities in Korea, that nation supplied more of the general imports than any other in 1950—

28 percent. A very great decrease in 1950 imports from China, normally the largest single source, is noteworthy; in 1950, 414 tons were received from China contrasted with 5,212 tons in 1949, based on 60-percent WO_3. The quoted prices for imported concentrates increased steadily throughout the year.

Consumption of concentrates (60-percent WO_3 basis) in the United States was 6,932 short tons in 1950, compared with 5,210 tons in 1949. Usage of tungsten concentrates for conversion to ferrotungsten decreased, but for direct charge to the steel bath and for the production of tungsten-metal powder and other tungsten products, it was much more than in 1949.

Industry stocks of tungsten concentrates (60-percent WO_3 basis) were 5,608 short tons on December 31, 1950, compared with 5,313 tons at the end of 1949.

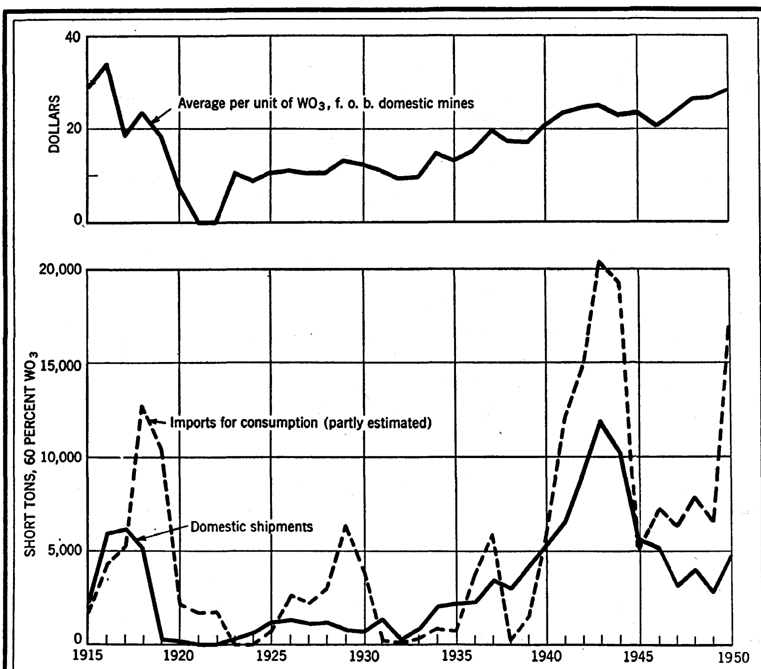

FIGURE 1.—Trends in domestic shipments, imports, and average price of tungsten ores and concentrates, 1915–50.

DOMESTIC PRODUCTION

The tungsten ore mined and milled in the United States, in general, contains 0.4 to 2.5 percent WO_3 and is beneficiated to a concentrate containing 60 percent or more WO_3. The leading tungsten producers in the Western States depend on ore carrying tungsten only as scheelite (calcium tungstate). Hübnerite (manganese tungstate) is the chief tungsten mineral in ores produced in North Carolina and, along with wolframite (iron-manganese tungstate) and ferberite (iron tungstate), contributed important quantities of the tungsten ore mined in 1950. Most of the concentrates are converted to ferrotungsten and tungsten-metal powder. Some high-purity concentrates, however, are charged directly to the steel bath.

TABLE 2.—Tungsten concentrates produced and shipped in the United States, 1949–50, by States

State	Produced				Shipped from mines			
	1949		1950		1949		1950	
	Short tons, 60 percent WO_3	Units	Short tons, 60 percent WO_3	Units	Short tons, 60 percent WO_3	Units	Short tons, 60 percent WO_3	Units
Alaska	(1)	15					13	787
Arizona	(1)	22	1	24	(1)	22	1	24
California	1,083	64,980	1,686	101,200	952	57,135	2,025	121,492
Colorado	220	13,217	197	11,805	222	13,311	196	11,802
Idaho	187	11,239	185	11,095	66	3,951	222	13,346
Missouri			(1)	18	2	117	(1)	18
Montana	9	554			9	554		
Nevada	598	35,855	1,009	60,558	740	44,405	1,123	67,363
North Carolina	942	56,484	1,088	65,271	770	46,216	1,240	74,393
Oregon	3	173			3	173		
Utah	1	31			1	31		
Total	3,043	182,570	4,166	249,971	2,765	165,915	4,820	289,225

[1] Less than 0.5 ton.

Following the increased demand for tungsten in 1950, some mines that had suspended operation resumed production, and nearly all of the producing mines increased their production rates. By the end of the year several producers had completed plans for further expansion. Output of concentrates (60-percent WO_3 basis) increased to 4,166 short tons in 1950 compared with 3,043 tons in 1949. Production in 1950 was obtained from many widely scattered operations in seven States, but three States—California, North Carolina, and Nevada—supplied 91 percent of the total; and seven operators—Bradley Mining Co., Climax Molybdenum Co., Nevada-Massachusetts Co., Nevada Scheelite, Inc., Surcease Mining Co., Tungsten Mining Corp., and United States Vanadium Corp.—produced 94 percent of the United States total. California was again the premier tungsten-producing State and North Carolina the second largest. The United States

TABLE 3.—Tungsten concentrates shipped from mines in the United States, 1946–50

Year	Quantity		Reported value f. o. b. mines		
	Concentrates 60 percent WO_3 (short tons)	Tungsten content (Pounds)	Total	Average per unit of WO_3	Average per pound of tungsten
1946	5,193	4,942,282	$6,283,413	$20.17	$1.27
1947	3,094	2,944,622	4,349,851	23.43	1.48
1948	4,033	3,838,287	6,355,386	26.27	1.66
1949	2,765	2,631,506	4,377,066	26.38	1.66
1950	4,820	4,587,687	8,170,924	28.25	1.78

Vanadium Corp. in California ascended to first place among United States producers of tungsten concentrates in 1950.

TABLE 4.—Tungsten ore and concentrates shipped from mines in the United States, by States, 1945–50, with shipments for maximum year and cumulative shipments in 1900–50, in short tons of 60 percent WO_3

State	Maximum shipments		Shipments by years							Total shipments, 1900–50	
	Year	Quantity	1945	1946	1947	1948	1949	1950		Quantity	Percent of total
								Quantity	Percent of total		
Alaska	1916	47		19	13			13	0.27	190	0.15
Arizona	1936	489	97	20	13	23	(1)	1	.02	3,914	3.00
California	1943	3,871	1,073	1,262	394	1,767	952	2,025	42.01	39,429	30.17
Colorado	1917	2,707	234	213	68	208	222	196	4.07	25,252	19.32
Connecticut	1916	3								11	.01
Idaho	1943	4,648	2,130	641	61	86	66	222	4.61	15,582	11.93
Missouri	1940	13				4	2	(1)	(2)	37	.03
Montana	1946	84	(1)	84	4	[3] 28	9			545	.42
Nevada	1942	3,052	1,857	2,617	2,002	949	740	1,123	23.30	38,566	29.51
New Mexico	1915	45								103	.08
North Carolina	1950	1,240	132	307	538	965	770	1,240	25.72	4,178	3.20
Oregon	1949	3					3			3	(2)
South Dakota	1917	270	4	1						1,296	.99
Texas	1946	1		1						1	(2)
Utah	1917	33	5	27	1	3	1			239	.18
Washington	1938	303	2	1						1,326	1.01
Total	1943	11,945	5,534	5,193	3,094	[3] 4,033	2,765	4,820	100.00	130,672	100.00

[1] Less than 0.5 ton.
[2] Less than 0.01 percent.
[3] Revised figure.

Alaska.—United States Tin Co. produced a small quantity of tungsten concentrate at its Lost River mine.

Arizona.—George W. Campbell produced 22 units from the Blue Eagle Claims in Yuma County; a very small production was obtained from one other deposit.

California.—California, with an increased output of 56 percent, again was the chief tungsten-producing State. Production of concentrates was 1,468 short tons averaging 69 percent WO_3 in 1950, compared with 952 tons averaging 68 percent WO_3 in 1949. Shipments of tungsten concentrates totaled 1,751 short tons averaging 69 percent WO_3, compared with 839 tons averaging 68 percent WO_3 in 1949. Although concentrates were produced at a number of widely scattered operations, five producers (Fresno Mining Co., Mineral Materials Co., Surcease Mining Co., Tulare County Tungsten Mines Co., and United States Vanadium Corp.) supplied 96 percent of the total. The bulk of the remainder was contributed by Adams & Van Voorhis, Consolidated Tungsten Co., Garnet Dike Mine Co., and Sherman Peak Mining Co.

The Pine Creek mine and concentrator of United States Vanadium Corp. near Bishop was the foremost producer of tungsten concentrates in the United States in 1950 and also treated considerable quantities of low-grade concentrates produced by other firms. Mining of ore from the low-level adit was in progress in 1950. The plant was operated at a greatly increased rate in 1950, and production of concentrates increased 70 percent over 1949.

Fresno Mining Co. operated the Strawberry mine at nearly the same rate as in 1949, in spite of a fire which damaged the plant and a flood that washed out roads near the mine. The mill was rebuilt, and the new plant with a capacity of about 100 tons per day was placed in operation in October. The Star Bright mine near Barstow, operated by Mineral Materials Co., entered the ranks of the top five producers in the State. The deposit was core-drilled in 1950.

Surcease Mining Co. produced 12 percent more concentrates than in 1949 from deposits near Atolia. The Big Jim mine in Tulare County, operated by Tulare County Tungsten Mines, produced over three times as much in 1950 as in 1949. Adams & Van Voorhis operated in Inyo County but reported that operations were discontinued before the end of 1950. Production decreased at the Harrel Hill mine operated by Consolidated Tungsten Co., and the mine was idle during part of 1950. The Garnet Dike Mine Co. in Fresno County increased its production rate in 1950; the total was more than four times its 1949 output. The Sherman Peak mine in Tulare County produced less than in 1949.

An article on tungsten, with special reference to California deposits, was published,[1] and another describes the Tungsten Hills, Inyo County.[2] The results of sampling by the Bureau of Mines at the Atolia district, San Bernardino County, were described.[3]

Colorado.—Production and shipments of tungsten concentrates (60-percent WO_3 basis) in Colorado were 197 and 196 short tons, respectively, in 1950, compared to 220 and 222 tons, respectively, in 1949.

The Climax Molybdenum Co. operated its byproduct plant for the recovery of tin, tungsten, and other minerals, all of which occur in very minor amounts in molybdenite ore treated at Climax in Lake County. Although the tungsten content of the molybdenite ore is low, the total recovery was large enough to raise the Climax mine to fifth place among United States producers in 1950.

Comparatively small quantities of tungsten concentrates were produced by leasers in Boulder County.

Idaho.—The Bradley Mining Co. operated the Ima mine in Lemhi County and recovered tungsten concentrates from tailings and from antimony-gold ore at the Yellow Pine mine in Valley County. Production at the Ima mine was less than in 1949; the Yellow Pine was not a tungsten producer in that year.

Missouri.—A small quantity of tungsten concentrates was produced and shipped from this State; however, this was probably sorted from old dumps, as no mine was reported to be producing tungsten ore.

Montana.—No production of tungsten was reported from this State in 1950. The Alps Mining & Milling Co. was exploring the Argo mine, which contains ferberite.

Nevada.—Nevada remained the third-ranking producing State in 1950. Production of concentrates was 794 short tons averaging 76

[1] California Division of Mines, Mineral Information Service, vol. 3, No. 6, June 1, 1950, pp. 1–3.

[2] Bateman, Paul C., Erickson, Max P., and Proctor, Paul D., Geology and Tungsten Deposits of the Tungsten Hills, Inyo County, Calif.: California Jour. Mines and Geology, vol. 46, No. 1, January 1950, pp. 23–42.

[3] Wiebelt, Frank J., and Ricker, Spangler, Investigation of the Atolia Tungsten Mines, San Bernardino County, Calif.: Bureau of Mines Rept. of Investigations 4627, 1950, 25 pp.

percent WO_3 in 1950, compared with 483 tons averaging 74 percent in 1949. Shipments were 883 short tons averaging 76 percent WO_3 in 1950, compared with 606 tons averaging 73 percent WO_3 in 1949.

The Nevada-Massachusetts Co. resumed operations at its Mill City plant in Pershing County. This firm again was the largest producer of tungsten in Nevada and the third-ranking producer in the United States. Production in 1950 increased 88 percent over that of 1949. Ore from underground sources in the Stank, Humboldt and Sutton No. 2 was supplemented by production from an open pit. The crushing plant was modified to obtain greater efficiency, and some changes are planned for the milling plant.

Nevada Scheelite, Inc., operating a mine of the same name in Mineral County, again was the second-largest producer of tungsten concentrates in Nevada. Its operating rate was considerably higher than in 1949.

The chief smaller producers of concentrates in 1950 were the Cherry Creek Mining Co., operating the Cherry Creek mine in White Pine County; Lincoln Mining Co., operating the Lincoln mine in Lincoln County; and Minerva Scheelite Mining Co., operating the Scheelite Chief mine in White Pine County.

Lindsay Mining Co. was constructing a mill to treat tungsten ore from the Gunmetal mine in Mineral County.

Several tungsten deposits in Nevada were described in Bureau of Mines Report of Investigations.[4]

North Carolina.—The Tungsten Mining Corp., operating the Hamme mine in Vance County, N. C., was the second-ranking producer of tungsten concentrates in the United States. Output was 1,086 short tons averaging 60 percent WO_3 in 1950, compared with 921 tons averaging 61 percent WO_3 in 1949. Shipments by the company were 1,200 short tons averaging 62 percent WO_3, compared with 783 tons averaging 59 percent WO_3 in 1949. During 1950 the company did 12,149 feet of diamond drilling and 5,804 feet of development. The Sneed Shaft was sunk from the 200 level to the 500 level.

The Furniss tungsten deposits in Cabarrus County are described in Report of Investigations 4724.[5]

Oregon.—A small quantity of tungsten ore was mined at the Bratcher deposit, Jackson County, Oreg. The ore was stockpiled for later milling.

Utah.—The West Tintic deposit in Juab County was described in Report of Investigations 4640.[6]

Wyoming.—The Romur deposits in Fremont County were described.[7]

---

[4] Geehan, Robert W., and Trengove, Russell, Investigation of Nevada Scheelite, Inc., Deposits, Mineral County, Nev.: Bureau of Mines Rept. of Investigations 4681, 1950, 13 pp.

East, J. H., and Trengove, Russell R., Investigation of Nightingale Tungsten Deposit, Pershing County, Nev.: Bureau of Mines Rept. of Investigations 4678, 1950, 8 pp.

Newman, E. W., Geehan, Robert W., and Trengove, Russell L., Investigation of Tungsten Metals Corp. Deposits (Minerva Mining District), White Pine County, Nev.: Bureau of Mines Rept. of Investigations 4648, 1950, 12 pp.

King, William H., and Holmes, George H., Jr., Investigation of Nevada Massachusetts Tungsten Deposits, Pershing County, Nev.: Bureau of Mines Rept. of Investigations 4634, 1950, 6 pp.

Holmes, George H., Jr., Investigation of Cherry Creek Tungsten District, White Pine County, Nev.: Bureau of Mines Rept. of Investigations 4631, 1950, 7 pp.

Binyon, E. O., Holmes, G. H., and Johnson, A. C., Investigation of the Tem Pinte Tungsten Deposit, Lincoln County, Nev.: Bureau of Mines Rept. of Investigations 4626, 1950, 16 pp.

[5] Jones, Jack O., and Peyton, Alexander L., Investigation of Furniss Tungsten Deposits, Cabarrus County, N. C.: Bureau of Mines Rept. of Investigations 4724, 1950, 24 pp.

[6] Wilson, Stephen R., Investigation of the West Tintic Tungsten Deposit, Juab County, Utah: Bureau of Mines Rept. of Investigations 4640, 1950, 13 pp.

[7] Frey, Eugene, and Wilson, Stephen R., Investigation of the Romur Tungsten Deposits, Fremont County, Wyo.: Bureau of Mines Rept. of Investigations 4629, 1950, 9 pp.

CONSUMPTION

Consumption of tungsten concentrates (60-percent WO_3 basis) in the United States was 6,932 short tons in 1950, compared with 5,210 tons in 1949. Of the total consumed in 1950, 1,165 tons (17 percent of the total) were converted into ferrotungsten, the form in which much of the tungsten is introduced into steel. However, high-purity tungsten concentrates are charged directly to the steel bath; 1,966 tons (28 percent of the total) were so used in 1950. Tungsten-metal powder and other tungsten products, chiefly the former, utilized 3,801 tons or 55 percent of the total concentrates consumed in 1950.

The unusually low percentage of consumption of concentrates for production of ferrotungsten was, in part, the result of a draw-down of the stocks of ferrotungsten in producers' plants; the amount of this decrease was equivalent to 555 tons of 60-percent WO_3 concentrates.

PRICES

Prices on imported tungsten concentrates advanced throughout 1950; prices on domestic concentrates increased during the last 4 months of the year. According to the Engineering and Mining Journal, quotations on imported concentrates ranged from $17.50 to $56 a short-ton unit of WO_3, duty paid; quotations on domestic scheelite of good known analysis ranged from $28.50 delivered to $47 f. o. b. mines. High-grade hübnerite concentrates of domestic origin were not listed early in the year but in December were quoted at $56.50, f. o. b. Henderson, N. C. The use of high-purity scheelite for direct smelting normally places a premium on this type of concentrate; this was the case in the early months of 1950, but at the year's end, the quotations reveal a reversal of this price situation. The unusually large percentage of tungsten concentrates used to produce tungsten-metal powder and other products not used in steel may have influenced the market; however, contracts for delivery of concentrates of the various types are also believed to have been an important factor.

As reported to the Bureau of Mines, the average price for domestic concentrates shipped was $28.25 a short-ton unit of WO_3 in 1950.

FOREIGN TRADE[8]

Domestic production is inadequate for requirements, and the United States imports both tungsten concentrates and products, chiefly the former. General imports (receipts) of ores and concentrates into the United States totaled 8,341,998 pounds (tungsten content), equivalent to 8,765 short tons of 60-percent WO_3 in 1950, a 13-percent increase over 1949. This quantity represents the ores and concentrates received in the United States, irrespective of final disposition. Although 22 foreign countries contributed material to this 1950 total, over 97 percent was obtained from 11 of these. There were significant changes in the import pattern in 1950. Korea replaced China as the main source of imports and contributed 2,344,505 pounds in that year, compared to 322,555 pounds in 1949; China dropped from first place to ninth and contributed only 394,441 pounds in 1950, compared to

[8] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

4,960,427 pounds in 1949; and there was a much wider distribution of important sources compared to 1949, when four nations supplied 94 percent of the total. Another important factor was a shift of imports from the wolframite group of minerals (iron-manganese tungstates) toward scheelite (calcium tungstate). Although there are no statistics to indicate the total quantities of each mineral type imported, mines in Australia, Brazil, and Korea—all major sources in 1950—are known to produce much scheelite, while China, formerly a very important source, produces much wolframite. As many consuming plants are designed to use only one type of tungsten concentrate, this trend could have considerable importance.

Imports of ores and concentrates for consumption in the United States were 16,147,313 pounds (tungsten content), equivalent to 16,966 short tons of 60-percent WO_3 in 1950, compared to 6,274,102 pounds in 1949. Imports for consumption represent ores and concentrates on which the duty has been paid and which have thereby entered the domestic commerce of the United States, and concentrates which enter duty-free for the United States Government. This classification includes concentrates that are withdrawn from bonded warehouses; actual physical imports of such concentrates may have been included under "general imports" in prior years. Much of the increase in imports for consumption indicated above was the result of warehouse withdrawals by the United States Government. China (46 percent), Korea (15 percent), Bolivia (11 percent), and Thailand (6 percent) were the original sources of 78 percent of the total.

In 1949, 434 short tons (60 percent WO_3) of ores and concentrates were withdrawn from warehouses for smelting, refining, and export; there were no such movements in 1950. In 1950, 328 tons (gross weight) were reexported and 7 tons (gross weight) exported, compared to 939 and 102 tons, respectively, in 1949. Of the 1950 exports, 13,440 pounds went to Germany and 614 pounds to Greece.

Imports of tungsten metal, chiefly from United Kingdom, were 210,972 pounds (13,455 pounds in 1949). Imports of ferrotungsten, chiefly from Japan, were 1,759,274 pounds (gross weight) containing 1,379,979 pounds of tungsten (45,295 pounds tungsten content in 1949). Reexports of ferrotungsten in 1950 were 164,157 pounds (gross weight). Imports of tungstic acid, all from Japan, contained 3,466 pounds of tungsten. Less than 200 pounds of tungsten were imported in 1950 in tungsten carbide, ferrochromium tungsten, tungsten-nickel, and other combinations containing tungsten (none in 1949).

Exports of ferrotungsten were 332,705 pounds (gross weight) in 1950 (620,645 pounds in 1949). Exports of tungsten metal, stellite, wire, shapes, and alloys other than ferrotungsten were 151,968 pounds (gross weight) in 1950 (106,860 pounds in 1949).

TABLE 5.—Tungsten ores and concentrates imported into the United States, 1949–50, by countries

[U. S. Department of Commerce]

Country	General imports [1]		Imports for consumption [2]		
	Gross weight (pounds)	Tungsten content (pounds)	Gross weight (pounds)	Tungsten content (pounds)	Value
1949					
Australia	113,120	64,480	138,547	77,893	$103,130
Belgian Congo	172,092	94,647	172,115	94,684	90,238
Bolivia	2,945,972	1,044,982	372,118	210,743	206,687
Brazil	115,530	64,496	221,138	120,640	136,496
Burma	142,797	72,737	10,278	5,862	5,139
China	9,509,713	4,960,427	8,750,628	4,548,046	4,164,729
French Indochina and French India			607,781	152,371	148,807
Japan			342	186	65
Korea	634,530	322,555	888,706	497,441	475,222
Mexico	167,768	84,239	66,724	21,358	23,711
Netherlands	6,081	3,456	6,081	3,456	3,341
Peru	55,124	31,074	57,555	32,619	19,438
Portugal	340	154	308	176	154
Siam	1,184,253	572,461	782,413	383;612	455,263
Southern Rhodesia			85,653	1,542	1,815
Spain	72,245	41,591	231,336	123,473	122,012
Total	15,119,565	7,357,299	12,391,723	6,274,102	5,956,247
1950					
Argentina	536,122	302,966	30,697	15,973	20,085
Australia	999,398	517,018	816,010	467,787	429,708
Belgian Congo	722,587	405,895	431,481	236,501	188,590
Belgium-Luxembourg	2,000	1.231	2,000	1,231	1,475
Bolivia	3,034,464	1,305,669	3,222,711	1,784,092	1,795,518
Brazil	1,336,776	753,807	1,435,021	810,149	930,753
Burma	168,310	81,882	217.766	120,925	115,216
Canada	2,000	507	41,199	10,012	16,480
China	796,162	394,441	13,457,528	7,439,167	6,854,002
Hong Kong	24,300	2,673			
Japan	770,416	453,862	950,516	541,672	563,704
Korea	4,708,793	2,344,505	4,667,571	2,481,707	2,257,907
Mexico	154,808	80,721	377,655	218,112	208,897
Mozambique	5,488	2,988			
Netherlands	15,646	10,799	95,752	56.668	51,061
New Zealand	44,068	22,718	42,269	22,718	28,272
Peru	1,014,126	559,127	1,007,747	559,077	457,513
Portugal	253,158	130,880	281,118	147,983	256,931
Siam	1,725,683	952,376	1,879,163	1,043,973	954,281
Spain	9,211	4,956	234,880	155,418	146,054
Switzerland	220	176			
Union of South Africa	22,692	12,801	61,249	34,148	32,953
Total	16,346,428	8,341,998	29,252,333	16,147,313	15,309,400

[1] Comprises ores and concentrates received in the United States; part went into consumption during year and remainder entered bonded warehouses.
[2] Comprises ores and concentrates withdrawn from bonded warehouses during year (irrespective of time of importation) and receipts during year for consumption.

WORLD REVIEW

Increased demand and higher prices tended to stimulate tungsten production in nearly every major producing nation. A historical review of world tungsten production from 1905 through 1948 was presented in the chapter of this series in Minerals Yearbook 1949 (pp. 1240–1246).

TABLE 6.—World production of tungsten ores, by countries, in metric tons of concentrates containing 60 percent WO_3, 1944–50

[Compiled by Berenice B. Mitchell]

Country	1944	1945	1946	1947	1948	1949	1950
North America:							
Canada	214			375	791	191	2
Cuba (exports)		9					
Mexico	267	107	75	77	133	65	67
United States (shipments)	9,329	5,020	4,711	2,807	3,659	2,508	4,403
Total North America	9,810	5,136	4,786	3,259	4,583	2,764	4,472
South America:							
Argentina	2,043	1,067	457	33	33	(1)	(1)
Bolivia (exports)	7,935	3,851	2,120	2,635	2,485	2,543	2,461
Brazil (exports)	2,221	2,192	1,623	1,329	1,144	575	[2] 700
Chile	3						
Peru	635	523	510	579	353	455	390
Total South America	12,837	7,633	4,710	4,576	4,015	[2] 3,600	[2] 3,600
Europe:							
Finland					4	49	20
France	84	185	286	408	567	700	[2] 400
Italy	2	6	13	10	4	1	2
Norway	4	5					
Portugal	4,088		630	3,149	2,944	2,700	2,500
Spain	2,393	283	431	461	876	888	815
Sweden	335	413	490	322	317	468	362
U. S. S. R. (estimate)	1,000	1,300	1,500	1,500	1,500	1,500	1,500
United Kingdom	350	120	108	89	33	39	61
Total Europe (estimate)	8,256	2,312	3,458	5,939	6,245	6,345	5,660
Asia:							
Burma	1,346			1,045	1,824	740	[2] 600
China	3,502	2,929	2,691	6,900	12,200	[2] 8,000	[2] 11,000
India	33	22	3				(1)
Indochina, French	83	8					
Japan	[3] 575	[3] 193	[3] 59	19	9	20	64
Korea:							
North	8,402	1,513	1,180	975	[2] 1,000	[2] 1,000	(1)
South				1,227	1,245	1,448	[2] 2,000
Malaya, Federation of	217	29	10	50	87	69	27
Thailand	1,135	461	201	486	495	742	855
Total Asia	15,293	5,155	4,144	10,702	16,860	12,019	[2] 14,600
Africa:							
Belgian Congo	433	513	397	670	236	276	164
Egypt	16				15		
Morocco, French	3				(4)		7
Nigeria	30	6	5	4	4	5	5
Southern Rhodesia	757	287	53	26	80	26	64
South-West Africa	118	4		10	12	6	4
Tanganyika (exports)					(4)	42	15
Uganda	95	92	102	139	126	183	217
Union of South Africa	660	452	144	91	151	416	96
Total Africa	2,112	1,354	701	940	624	954	572
Oceania:							
Australia:							
New South Wales	53	53	42	45	35	11	13
Northern Territory	102	140	74	103	72	59	45
Queensland	229	155	75	82	96	57	29
Tasmania	300	800	850	902	1,031	1,242	1,136
New Zealand	159	37	30	24	28	28	24
Total Oceania	843	1,185	1,071	1,156	1,262	1,397	1,247
Grand total (estimate)	49,200	22,800	18,900	26,600	33,600	27,100	30,100

[1] Data not available; estimates by author of chapter included in total.
[2] Estimate.
[3] Preliminary data for the fiscal year ended March 31 of year following that stated.
[4] Less than 1 ton.

Argentina.—Argentina formerly ranked as the second largest producer of tungsten in South America, with peak production in 1943 of 2,390 metric tons (60 percent WO_3). However, since 1943 production has declined continuously and virtually ceased in 1946. The 1950 actual production is not known, but the United States received 302,966 pounds, metal content, from Argentina. It was reported that operations at the Los Condores mine in San Luis were discontinued. This mine was the largest tungsten producer in Argentina during World War II.[9]

Australia.—During the year ended October 31, 1950, King Island Scheelite, Ltd., mined 160,533 long tons of ore, all by open-cut methods. The mill treated 160,167 long tons of ore averaging 0.54 percent WO_3 from which 776 tons of scheelite concentrates with an average grade of 67 percent WO_3 were produced. In the corresponding year, ended October 31, 1949, it milled 158,384 long tons averaging 0.59 percent WO_3, which yielded 971 tons of concentrate averaging 67.51 percent WO_3. Production during the early months of the year was curtailed because of a shortage of water. At the end of October 1950, the firm reported that ore reserves exceeded 2,500,000 tons and that long-term contracts for the sale of concentrates had been entered with the British Government and the United States Government. Arrangements were made to send a good part of the firm's output to the United States for refining.[10]

Belgian Congo.—In recent years Belgian Congo has maintained a regular production of tungsten concentrates. The deposits are reported to be placer-type, with recovery by sluices. In most instances, cassiterite is present in the concentrates along with wolframite.[11] Separation is made by hand-sorting coarse material and by electromagnetic treatment of fines. Much of the production is from the Marchal mines in the Kifurwe area to the east of Ruhengeri.

Canada.—Leedoro Snow Lake Mines, Ltd., is exploring a scheelite deposit in Northern Manitoba.

England.—At the Castle-an-Dinan mine a 1,000-gallon electric pump was installed, and development was in progress on three levels.[12] An extensive but low-grade deposit at Hemerdon near Plymouth is reported to have been sampled by the Ministry of Supply. The tests are said to have established the existence of 4,000,000 tons of ore of a probable grade of 3.19 pounds and 0.82 pound of equivalent 65-percent tungsten and tin concentrates, respectively, per ton of ore, of which 2.78 pounds and 0.71 pound, respectively, were estimated to be recoverable.[13]

Finland.—Scheelite concentrates are reported to be produced as a byproduct of copper mining.[14] The Ylöjärvi mine is reported to have produced, in 1949, 36 metric tons of scheelite concentrate containing 76 percent WO_3 from the tungsten-bearing portion of the ore body; the 93,573 metric tons of ore mined also produced 915 tons of copper.[15]

France.—Early in 1950 directors of the firm that operates the tungsten mine at Puy-les-Vignes, near Saint-Leonard-de-Noblat, in

9 Engineering and Mining Journal, vol. 151, No. 2, February 1950, p. 171.
10 Mining World, vol. 12, No. 5, May 1950, p. 50.
11 Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 1, January 1950, pp. 21–22.
12 Mining World, vol. 12, No. 1, January 1950, p. 52.
13 South African Mining and Engineering Journal, vol. 60, part II, No. 2971, p. 705.
14 Metal Bulletin, No. 3450, Dec. 13, 1949, p. 16.
15 Mining World, vol. 12, No. 6, Apr. 15, 1950, p. 67.

the Department of Haute-Vienne, ordered the mine to cease operations owing to its inability to compete with low-priced imported tungsten concentrates. Annual requirements of France are said to be 1,800 metric tons of concentrates, of which 600 tons are produced at the three operating mines in that country.[16]

Portugal.—Portugal is the largest producer of tungsten concentrates in Europe. The Panasqueira, Ribeira, and Borralha mines are the chief producers, but numerous very small operations also contribute to production, particularly in periods when the price is high. As a result of low prices early in 1950, the Borralha mine virtually ceased operations and the Panasqueira began shifting to tin mining. Later in the year the Borralha resumed operations.[17]

Russia.—Tungsten is reported to be produced at the Djidinsk mine south of the southern tip of Lake Baikal and at the Tyrny Auz mine in the Caucasian district. Tungsten ore mined in the Urals between Sverdlovsk and Magnitogorsk is said to be smelted at Chelyabinsk.[18]

Southern Rhodesia.—Southern Rhodesia has been a producer of tungsten since 1906. It is reported that many of the mines produced scheelite but that the Tshontanda mine, a wolframite producer, situated at the western end of the Gwani tin fields, has produced nearly 24 percent of the value of the Colony's total tungsten production up to the end of 1947.[19] Most of the scheelite deposits are said to be in recognized gold belts; the Hippo mine in the lower Sabi Valley is an exception.

[16] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 3, March 1950, p. 27.
[17] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 5, May 1950, p. 24.
[18] Metal Bulletin (London), No. 3490, May 9, 1950, p. 18.
[19] South African Mining and Engineering Journal, vol. 60, part II, No. 2968, Dec. 31, 1949, p. 595.

Uranium, Radium, and Thorium

By Jack W. Clark and H. D. Keiser

GENERAL SUMMARY

URGENCY was the keynote of the atomic energy program in 1950. Definite knowledge prevailed that the U. S. S. R. possessed the atomic bomb; moreover, the confession of Dr. Klaus Fuchs and the defection of Prof. Bruno Pontecorvo provided reason for believing that the Soviet Union possessed sufficient information for further rapid development of atomic weapons. Communist aggressors in Korea drove back United Nations forces the latter part of the year, and on December 16, 1950, President Truman proclaimed a state of national emergency. Congress soon thereafter approved appropriations for the atomic energy program, bringing the total to over $2,000,000,000 for the fiscal year ending June 30, 1951.

Construction of the so-called hydrogen or superbomb was authorized early in 1950, and on November 28 the Atomic Energy Commission announced plans for a $260,000,000 Savannah River Project in Aiken and Barnwell Counties, S. C. As further needs developed for the atomic energy program as a whole, this project was increased in scope before the close of the year. In addition, the AEC announced on December 15 plans for constructing a new $500,000,000 facility at the Kentucky Ordnance Works, near Paducah, Ky., to produce uranium-235 by the gaseous diffusion process, thereby increasing markedly the future availability of that atomic bomb material.

This same rapid expansion featured all phases of the atomic energy program in 1950. Production of domestic uranium ore was the highest on record, placing the United States ahead of Canada in rank and second only to the Belgian Congo. Outputs of the fissionable isotope uranium-235 and plutonium were at new record rates and at new low unit costs. Shipments of radioisotopes were substantially larger in number than in any previous year.

MINE AND MILL PRODUCTION

Most of the production of domestic uranium ore in 1950 resulted from greatly increased activity in the Colorado Plateau region in southwestern Colorado, southeastern Utah, and northeastern Arizona. More than 200 separate mining operations employing an aggregate of at least 1,600 men were reported.[1] Plants for processing the ores were operated by the Vanadium Corp. of America at Naturita and Durango,

[1] Haldane, William E., Uranium Mining Is Primarily a Field for Small Operators: Min. World, vol. 13, No. 1, January 1951, pp. 28–30.

232294—53——80

Colo.; the United States Vanadium Corp. at Rifle and Uravan, Colo.; and the Galigher Co. (for the AEC) at Monticello, Utah. A pilot plant for treating copper-uranium ores was operated at Hite, Utah, by the Vanadium Corp. of America. Two additional plants were nearing completion as the year closed—that of the Climax Uranium Co. at Grand Junction, Colo., and the plant taken over for remodeling at Salt Lake City, Utah, by the Vitro Manufacturing Co.[2] Uranium ore processing operations were described.[3]

Exploratory diamond drilling on the Colorado Plateau in 1950 by the AEC and by the Geological Survey on behalf of the AEC was at a combined rate of 300,000 to 400,000 feet a year and effected an increase in ore reserves.[4] Development operations in the Marysvale, Utah, area during 1950 were so encouraging that the AEC opened an ore-buying station at Marysvale on March 15 and on August 30 announced the accumulation of a stockpile of 1,000 tons of ore at the station, with some receipts of ore assaying 0.8 percent U_3O_8. Similar results were achieved during the year in the Lukachukai Mountains area, in the northern part of the Navajo Indian Reservation, Ariz. where 50,000 feet of diamond drilling was completed by the AEC in 1950.[5] Probably the most significant uranium discovery in 1950 was that made almost at the year end near Grants, N. Mex., along the main line of the Atchison, Topeka & Santa Fe Railway Co., where carnotite was found in limestone. The discovery extended the known limits of the sedimentary uranium deposits in the region.

Other significant developments in 1950 included further exploration of the primary uranium occurence discovered during 1949 in the Sunshine mine, Coeur d'Alene district, Idaho; prospecting by the Jones & Laughlin Ore Co. of the pitchblende deposit discovered late in 1949 on the upper peninsula of Michigan;[6] and exploration at the Caribou mine, in the Colorado Front Range.[7] Additional promising prospects were reported to have been found during 1950 in Arizona, Colorado, Idaho, Michigan, Montana, Nevada, New Mexico, Utah, and Wyoming, with an increasing number of mining companies investigating uranium deposits.[8]

The possibility of recovering uranium from low-grade uraniferous sediments continued to have the consideration of the AEC in 1950.[9] These sediments comprise principally the black shales, particularly the Chattanooga shale of the east-central United States and its equivalent in the midcontinent area; the land-pebble phosphate deposits in Florida; and the Phosphoria formation in Idaho, Montana, Utah, and Wyoming. International Minerals & Chemical Corp. announced plans to recover uranium as a byproduct in the processing of its Florida phosphate ores.[10]

---

[2] MacPherson, Frank H., General Plans of the Colorado Raw Materials Office (AEC) for the Year 1951: Address before Colorado Min. Assoc., Denver, Colo., Feb. 2, 1951.

[3] McQuiston, F. W., Jr., Processing Uranium Ores: Min. Cong. Jour., vol. 36, No. 10, October 1950 pp. 28–30.

McGrath, M. G., Uranium Recovery at Monticello: Min. World, vol. 12, No. 4, April 1950, pp. 11–13.

[4] Johnson, Jesse C., Uranium Procurement Policies: Address before Am. Min. Cong., Salt Lake City, Utah, Aug. 30, 1950.

[5] Oster, Thomas W., Uranium Exploration: Address before Colorado Min. Assoc., Denver, Colo., Feb. 2, 1951.

[6] Atomic Energy Commission, Eighth Semiannual Report (Control of Radiation Hazards in the Atomic Energy Program): July 1950, p. 166.

[7] Wright, Robert J., Current Status of Atomic Raw Materials: Address before Mining Branch, Southern California Section, Am. Inst. Min. and Met. Eng., Los Angeles, Calif., June 14, 1950.

[8] Work cited in footnote 4.

[9] Work cited in footnote 7.

[10] Oil, Paint and Drug Reporter, International Minerals to Produce Uranium in Florida for Atomic Energy Commission: Vol. 158, No. 18, Oct. 30, 1950.

In a survey of domestic thorium resources, the investigation of the monazite content of placer deposits, principally in Idaho and California, was continued in 1950 by the Bureau of Mines under contract to the AEC.[11] Domestic production of monazite as a coproduct of the Florida titanium-mining industry was on an increasing scale in 1950; production of monazite on a small scale was begun in Idaho during the year.

New types of radiation-detection instruments, particularly the scintillometer, were developed and applied in 1950.[12] Numerous publications were issued in 1950 relative to uranium and thorium raw materials.[13]

REFINERY AND REACTOR PRODUCTION

Uranium.—Production in 1950 of the fissionable isotope uranium–235 was achieved at a new record rate and at new low unit costs. Construction of the K–29 and K–31 additions to the Oak Ridge, Tenn., gaseous diffusion plant proceeded throughout the year. On December 15, 1950, the AEC announced plans for constructing a new facility to produce uranium–235 by the gaseous diffusion process on a 5,000-acre site at the Kentucky Ordnance Works, 16 miles west of Paducah, Ky. Union Carbide & Carbon Corp. will operate the new plant, the cost of which was estimated at $500,000,000. Construction of a chemical processing plant for recovering nuclear fuel from used reactor fuel elements at the reactor testing station, Arco, Idaho, was announced by the AEC; estimated cost of the plant was $8,000,000. The American Cyanamid Co. will operate the plant.

Plutonium.—Plutonium was also produced in 1950 at a new record rate and new low unit costs. Construction continued throughout the year on the expansion program underway at the Hanford, Wash., plutonium works.

TABLE 1.—Radioisotopes shipped by the U. S. Atomic Energy Commission, by kinds, 1946–50, in number of shipments

Radioisotope	1946 [1]	1947	1948	1949	1950	Total
Iodine-131	68	495	978	1,537	2,353	5,431
Phosphorous-32	48	537	901	1,420	1,736	4,642
Carbon-14	47	108	124	192	259	730
Sodium-24	1	80	119	229	286	715
Sulfur-35	12	39	41	108	125	325
Gold-198 and gold-199	17	52	29	36	164	298
Cobalt-60	4	32	30	64	137	267
Potassium-42	6	31	24	75	123	259
Calcium-45	5	42	33	68	89	237
Iron-55 and iron-59	5	41	33	54	68	201
Strontium-89 and strontium-90	3	9	18	19	46	95
Others	30	186	314	568	848	1,946
Total	246	1,652	2,644	4,370	6,234	15,146

[1] Shipped by Manhattan District, Corps of Engineers, U. S. Army Service Forces.

Isotopes.—Production, processing, and distribution of radioisotopes by the AEC in 1950 were centered at the Oak Ridge, Tenn., National

[11] Work cited in footnote 7.

[12] Brownell, George M., Radiation Surveys with a Scintillation Counter: Econ. Geol., vol. 45, No. 2, March–April 1950, pp. 167–174.
Stead, Frank W., Airborne Radioactivity Surveying Speeds Uranium Prospecting: Eng. and Min. Jour., vol. 151, No. 9, September 1950, pp. 74–77.

[13] See selected bibliography at the end of this chapter listing publications not mentioned in footnotes.

Laboratory. Over 100 different kinds of radioisotopes were produced, with half lives ranging from a few hours to thousands of years. A new facility for handling and shipping isotopes, costing $2,400,000, was placed in operation at Oak Ridge in February 1950.

Radium.—Production of radium in the United States was practically at a standstill in 1950, except for a small amount salvaged from consumers' wastes. Processes employed by plants extracting uranium from domestic ores made no provision for radium recovery; hence, no radium-rich residues were available for further refinement. Radium and its derivatives were produced by the Canadian Radium & Uranium Corp. at its Mount Kisco, N. Y., refinery.

Thorium.—A few tens of thousands of pounds of thorium compounds were produced in 1950 in the United States in conjunction with the production of rare earths. Output of thorium metal was virtually negligible. Principal producers of thorium compounds (chiefly nitrate and oxide) were Lindsay Light & Chemical Co., West Chicago, Ill., and Maywood Chemical Works, Maywood, N. J.

TABLE 2.—Shipments of primary radium refined in the United States, 1941–43 (average) and 1944–48 [1]

Year	From domestic ores		From Canadian ores		Total	
	Milligrams	Estimated value	Milligrams	Estimated value	Milligrams	Estimated value
1941–43 (average)	2,042	$51,600			2,042	$51,600
1944	200	3,700	21,800	$403,300	22,000	407,000
1945	200	3,700	31,400	580,900	31,600	584,600
1946	200	3,700	17,400	321,900	17,600	325,600
1947	16,400	303,400			16,400	303,400
1948	4,219	77,980	3,510	63,200	7,729	141,180

[1] Excludes confidential figures representing certain shipments in October 1943 to May 1944. Data for 1949–50 withheld to avoid disclosure of individual company operations.

CONSUMPTION AND USES

Weapons.—On January 31, 1950, President Truman announced that he had directed the AEC "to continue its work on all forms of weapons, including the so-called hydrogen or superbomb."[14] Atomic weapons were produced in 1950 at the rate authorized by the President,[15] and uranium–235 and plutonium were produced at a new record rate, exceeding that of 1949.[16] Pursuant to the Presidential directive of January 31, the AEC announced on November 28, 1950, plans for the Savannah River Project, which involved construction of new facilities, on a 200,000-acre tract in Aiken and Barnwell Counties, S. C., to be designed, built, and operated by E. I. du Pont de Nemours & Co., wartime builders and operators of the Hanford, Wash., Engineer Works.[17] Total cost of the new facilities was estimated at $260,000,000. Preparations were continued for additional full-scale weapons tests, and the Eniwetok Proving Ground in the Marshall Islands was maintained. The AEC was authorized to use part of the 5,000-square-

[14] Work cited in footnote 6, p. ix.
[15] Work cited in footnote 6, p. 166.
[16] Work cited in footnote 6, p. 165.
[17] Atomic Energy Commission, Ninth Semiannual Report (AEC Contract Policy and Operations): January 1951, p. 4.

mile Las Vegas, Nev., bombing and gunnery range for experiments necessary to the atomic weapons development program. Construction proceeded on new facilities for the Los Alamos, N. Mex., scientific laboratory and for the Sandia Corp. at Albuquerque, N. Mex.[18]

Industrial Power.—Nuclear energy as a possible source of industrial power continued to be the subject of much discussion in 1950,[19] with the general outlook for such a development in the relatively near future somewhat more encouraging than it had been in 1949. Completion of the AEC experimental breeder reactor, under construction in 1950 at the Commission's reactor-testing station near Arco, Idaho, was awaited with much interest (*see* Minerals Yearbook 1949, p. 1251). This reactor will test the feasibility of creating new nuclear fuel faster than it is consumed and will produce a small amount of power for experimental purposes.[20]

At the reactor station in Idaho the AEC began construction in 1950 of a materials-testing reactor and a land-based prototype submarine thermal reactor. The materials-testing reactor was designed to operate in the thermal, or slow, neutron energy range and will supply scientists with a much-needed tool to test materials under intense neutron bombardment. Although construction of the submarine thermal reactor was for the Navy, it was said to be giving impetus to the ultimate use of nuclear energy for industrial power production. At the Knolls (Schenectady, N. Y.) atomic power laboratory, development of a submarine intermediate-reactor power plant was undertaken for the Navy that will operate in a neutron-energy-range intermediate between thermal, or slow, neutrons and high-energy neutrons. The Oak Ridge, Tenn., national laboratory of AEC began construction of a pilot model of a fluidized reactor. All AEC reactors, except the Los Alamos, N. Mex., water boiler, are heterogeneous; that is, the fuel and moderator are separate, and in most reactors both are solids. In a fluidized reactor, fuel and moderator are mixed in a liquid.[21]

During 1950 the AEC received several inquiries looking toward the designing and constructing of nuclear reactors with private capital and their operation and use by industry. The proposals were welcomed by the Commission, which stated that it was studying the problems involved.[22]

---

[18] Work cited in footnote 17, pp. 6–7.

[19] Ayres, Eugene, and Thomas, Charles A., What Are the Prospects for Industrial Nuclear Power: Nucleonics, vol. 7, No. 2, August 1950, pp. 72–78.

Cockcroft, J. D., The Development of Power from Nuclear Energy: 4th World Power Conference, London, 1950, Section J, Paper 1, 8 pp.

Daniels, Farrington, Atomic and Solar Energy: Am. Scientist, vol. 38, No. 4, October 1950, pp. 521–548.

Dunning, J. R., The Future of Atomic Energy: Am. Scientist, vol. 38, No. 1, January 1950, pp. 60–84.

Glasstone, Samuel, Scource Book on Atomic Energy: D. Van Nostrand Co., New York, N. Y., 1950, 546 pp.

Hafstad, Lawrence R., Power from Atomic Reactors: Metal Prog., vol. 58, No. 6, December 1950, pp. 869–873; Reactor Program of the Atomic Energy Commission: Remarks before Am. Petrol. Inst., Los Angeles, Calif., Nov. 15, 1950; The Outlook for Atomic Energy: Min. Cong. Jour., vol. 36, No. 10, October 1950, pp. 82–83.

Liljeblad, Ragnar, Some Economic and Technical Aspects of the Use of Nuclear Fuel for Power Production: 4th World Power Conference, London, 1950, Section J, Paper 5, 4 pp.

Kingdon, K. H., Production of Enriched Nuclear Fuel: Gen. Elec. Rev., vol. 53, No. 5, May 1950, pp. 10–11.

Ohlinger, L. A., Engineering Aspects of Nuclear Reactors: Nucleonics, vol. 5, No. 6, December 1949, pp. 38–49; vol. 6, No. 1, January 1950, pp. 10–17, 25; No. 2, February 1950, pp. 54–63; No. 3, March 1950, pp. 46–57.

Schurr, Sam H., and Marschak, Jacob, Economic Aspects of Atomic Power: Princeton University Press, 1950, 289 pp.

Sporn, Philip, Prospects in Industrial Application of Atomic Energy: Bull. Atomic Scientists, vol. 6, No. 10, October 1950, pp. 303–306, 320.

[20] Work cited in footnote 17, p. 7.

[21] Work cited in footnote 17, pp. 7–8.

[22] Work cited in footnote 17, p. 11.

TABLE 3.—Nuclear reactors operating, under construction, or proposed for near-future construction in various countries [1]

Country	Date of beginning operation	Fuel	Moderator	Coolant	Neutron velocity	Capacity (kw.)	Use
United States:							
Arco, Idaho	Under construction	Enriched uranium metal	(?)	Liquid metal	Fast	Very much higher than Los Alamos fast reactor.	Research in breeding fissionable material, heat transfer, and power production.
Do	do	Enriched uranium metal (?).	(?)	do (?)	Slow	Large	Research in testing reactor construction materials.
Do	do	do	(?)	do (?)	do	do	Research in power generation for submarine propulsion and industrial use.
Brookhaven, N. Y	Aug. 22, 1950	Uranium metal	Graphite	Air	do	30,000	Research and radioisotope and experimental-power production.
Chicago, Ill	Dec. 2, 1942 (subsequently dismantled and rebuilt at a different site).	Uranium metal and oxide.	do	None	do	Few kilowatts	Do.
Do	May 15, 1944	Uranium metal	Heavy water	Heavy water	do	300	Research.
Do	Under construction	do	do	(?)	do	Greater than 300	Do.
Hanford, Wash	February 1944	do	Graphite	(?)	do	Small	Research in plutonium production.
Do	3 additional reactors began operating 1944–45.	do	do	Water	do	Possibly 500,000 to 1,500,000.	Production of plutonium and radioisotopes.
Los Alamos, N. Mex	May 1944	Enriched uranium salts	Water	do	do	10	Weapons research.
Do	November 1946	Plutonium	None	Liquid metal	Fast	Variable	Do.
Oak Ridge, Tenn	Nov. 4, 1943	Uranium metal	Graphite	Air	Slow	Greater than 2,000	Research and radioisotope production.
Do	Under construction	Uranium salts (?)	Water (?)	(?)	(?)	(?)	Research in homogeneous type reactors.
Raleigh, N. C	do	Enriched uranium salts	Water	Water	Slow	10	Research.
Ellenton, S. C	3 reactors under construction.	Uranium metal	Heavy water	(?)	do	Possibly 500,000 to 1,500,000.	Production of tritium, plutonium, and radioisotopes.
Schenectady, N. Y	1948 (?)	Enriched uranium metal (?).	(?)	(?)	Intermediate (?).	Small	Experiments in reactor assembly.
West Milton, N. Y	Under construction	do	(?)	Liquid metal	Intermediate	Large	Research in power generation for submarine propulsion and industrial use.

Canada:							
Chalk River, Ont	September 1945	Uranium metal	Heavy water	None	Slow	3.5 watts	Research.
Do	Sept. 5, 1945	do	do	Water and air	do	10,000	Research and plutonium and radioisotope production.
Do	Under construction	(?)	do	(?)	(?)	Very large	Do.
France:							
Chatillon	Dec. 15, 1948	Uranium oxide	do	None	Slow	Few watts	Research.
Saclay	Construction begun August 1949.	Uranium metal	do	Nitrogen gas	Slow (?)	1,500	Research and radioisotope production.
Do	Planned for construction	do	(?)	(?)	do	Large	Plutonium production.
Netherlands.[2]							
Norway: Kjeller	Under construction	Uranium metal	Heavy water	(?)	Slow	100	Research and radioisotope production.
Sweden	do	Uranium metal (?)	(?)	(?)	(?)	(?)	Industrial power research.
U. S. S. R	Later than 1945 (?)	do	Graphite (?)	Water (?)	Slow (?)	Probably similar to Hanford, Wash., reactors.	Production of plutonium and radioisotopes.
United Kingdom:							
Harwell	August 1947	Uranium metal	Graphite	Air	Slow	100	Research and radioisotope production.
Do	July 3, 1948	do	do	do	do	6,000 (being increased to 10,000).	Do.
Sellafield	1949–50	do	do	Water	do	Probably similar to Hanford, Wash., reactors.	Production of plutonium and radioisotopes.

[1] In addition, India, Belgium, Denmark, Switzerland, Union of South Africa, and Argentina have declared their intention to build research reactors, and scientists in Western Germany have requested permission to build a reactor for fundamental research.

[2] Building reactor in cooperation with Norway. (*See* Norway)

Radiography.—As of December 1950, AEC-supplied isotopes were in use in 939 departments of 485 institutions in 47 States and Territories of the United States, compared with use in 549 departments of 305 institutions in 1949 and use in 241 departments of 160 institutions in 1947. Growth in isotope distribution was said to stem mainly from an increase in the number of scientists and technical personnel experienced in using radioactive materials, plus the construction and operation of a new AEC radioisotope-processing facility at the Oak Ridge, Tenn., national laboratory that made it possible to offer a wider range of radiomaterials at reduced costs.[23]

The AEC made 6,234 shipments of radioisotopes in 1950, or over 40 percent of the total 15,000 shipments made since the isotopes program was initiated in 1946. The major part of the radioisotope shipments in 1950 was for use in the field of medical therapy; but important new uses were developed in industry, particularly for cobalt-60, and were discussed in the scientific and technical press.[24] Radium was used principally in medical therapy, as an energy source in luminous paints, and for industrial radiography. New graphs were published for the exposure time required for radium radiography of steel.[25]

TABLE 4.—Radioisotopes shipped by the U. S. Atomic Energy Commission, by uses, 1946–50, in number of shipments

Use	1946 [1]	1947	1948	1949	1950	Total
Medical therapy	88	716	1,142	2,037	3,037	7,020
Animal physiology	78	508	777	1,028	1,230	3,621
Physics	17	134	202	315	448	1,116
Chemistry	27	138	225	228	274	892
Plant physiology	16	62	116	241	319	754
Industrial research	14	51	85	176	270	596
Bacteriology	4	33	53	83	87	260
Metallurgy	2	10	11	(2)	(2)	23
Other			33	262	[3] 569	864
Total	246	1,652	2,644	4,370	6,234	15,146

[1] Shipped by Manhattan District, Corps of Engineers, U. S. Army Service Forces.
[2] Included in "Industrial research."
[3] Specific field of utilization unknown (issuance of general authorizations permits approved applicant to use radioisotopes at a specified location for any research and development activity and permits him to obtain from any supplier any available form and quantity of any radioisotope distributed on authorization or approval of the U. S. Atomic Energy Commission).

PRICES

Uranium Ore.—Prices paid by the AEC in 1950 for uranium were the same as in 1949 (*see* Minerals Yearbook 1949, pp. 1253–1255), except that new pricing applied to ores from the Marysvale, Utah, area. On March 12, 1950, the AEC announced that an ore-purchase depot would be established at Marysvale and that the ores would

[23] Work cited in footnote 17, pp. 26–27.
[24] Czygan, William, Cobalt-60: Iron Age, vol. 166, No. 8, Aug. 24, 1950, pp. 68–72.
Gaudin, A. M., Speddin, H. R., and Research Staff, The Adaptation of Tracer Techniques to Mineral Engineering Problems: Annual Progress Report, Dept. of Metallurgy, Massachusetts Inst. Technol., Cambridge, Mass., Jan. 31, 1950, 16 pp.
Morrison, Adair, Radiography with Cobalt-60: Nucleonics, vol. 5, No. 6, December 1949, pp. 19–32.
Radioactive Tracers Used to Study Plating Process: Iron Age, vol. 165, No. 5, Feb. 2, 1950, p. 89.
Simard, G. L., Chupak, J., and Salley, D. J., Radiotracer Studies on the Interaction of Diothiophosphate with Galena: Min. Eng., vol. 187, No. 3, March 1950, p. 359.
Metal Industry, Tracers in Metallurgy: Vol. 77, No. 6, Aug. 11, 1950, p. 81.
[25] Morrison, A., Exposures for Radium Radiography of Steel: Metal Prog., vol. 57, No. 6, June 1950, p. 780-B.

be purchased under contractual agreements negotiated with individual producers. On October 23, 1950, the Commission announced that lower-grade development ore would be accepted from the area. Under the new policy development ore containing as little as 0.10 percent U_3O_8 was acceptable, provided deliveries averaged about 0.15 percent. Previously, the minimum acceptable grade was 0.20 percent, with an average grade of 0.30 percent. The development allowance, under the new policy, was set so that payment, including the allowance, for ores containing 0.10 to 0.20 percent U_3O_8 amounted to $2.50 per pound of contained U_3O_8. The new pricing schedule for the Marysvale ores applied only to ores extracted during the prospecting and development stages of operations.

TABLE 5.—Consumption of uranium and thorium compounds for nonenergy purposes in the United States, 1945–50, in pounds of contained U_3O_8 and ThO_2

[U. S. Atomic Energy Commission]

Industry	1945	1946	1947	1948	1949	1950
URANIUM (U_3O_8 EQUIVALENT)						
Chemical (including catalytic)	(1) 3,800	2,500	2,400	1,993	2,426	2,835
Ceramic (including glass)	150	1,000	825	385	270	938
Photographic	(1)	360		225		
Electrical	1,000	300	150	200	103	33
Total U_3O_8	4,950	4,160	3,375	2,803	2,799	3,806
THORIUM (ThO_2 EQUIVALENT)						
Gas-mantle manufacture	(2)	(2)	26,658	36,697	44,621	48,471
Refractories and polishing compounds	(2)	(2)	3,110	1,634	1,847	1,889
Chemical and medical	(2)	(2)	1,176	1,767	596	2,097
Electrical	(2)	(2)	1,283	427	237	314
Total ThO_2	(2)	(2)	32,227	40,525	47,301	52,771

1 Photographic included with chemical.
2 Figure not available.

Uranium.—High-purity uranium metal was available throughout 1950 to AEC licensees at about $50 a pound. The metal, in the form of pencil-size rods about 4 inches long, was produced by Mallinckrodt Chemical Co., St. Louis, Mo., and distributed to all the major chemical companies, from whom the metal was available to the licensees in its original rod form, as rolled sheets, or as foil.

Radium.—Radium was quoted throughout 1950 at $25 to $30 per milligram of radium content, depending on quantity.

Isotopes.—Isotopes were available in 1950 through the Isotopes Division of AEC in a wider range and at lower prices than in 1949. All isotopes used to study, diagnose, or treat cancer and allied diseases were made available free of production costs.

Thorium.—Average prices in 1950 for thorium nitrate and oxide were reported by a large producer in 100-pound lots, f. o. b. producer's plant, as follows: Thorium nitrate, mantle grade—domestic price $2.20 per pound, export $3.50 per pound; thorium oxide, 97 percent ThO_2—domestic price $5.00 per pound; thorium oxide, photographic-lens grade, 99 percent ThO_2—domestic price $10.00 per pound. (*See* Minor Nonmetals chapter of this volume for monazite prices.)

FOREIGN TRADE [26]

The AEC announced that in 1950 receipts of foreign ore continued at a satisfactory rate and that new foreign sources of supply had been developed. Uranium used by the AEC is obtained principally from the Belgian Congo and Canada. Data are not disclosed on imports and exports of uranium and thorium ores, concentrates, metal, alloys, and compounds. Cumulative exports of radioisotopes reported by the AEC as of November 30, 1950, reached 975 shipments distributed among 29 different nations.

TABLE 6.—Radium salts imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

Year	Radium salts			Radioactive substitutes (value)
	Milligrams	Value		
		Total	Average per gram	
1946	16,596	$325,922	$19,600	
1947	76,681	1,504,814	19,600	
1948	77,018	1,385,337	17,900	$6,273
1949	98,032	1,719,656	17,500	370
1950	80,969	1,235,511	15,300	6,106

WORLD REVIEW

On October 24, 1950, in his United Nations Day speech at Lake Success, N. Y., President Truman proposed that the work of the United Nations Atomic Energy Commission and the United Nations Commission on Conventional Armaments be "revitalized" by continuing it through "a new and consolidated disarmament commission." [27]

At the Fifth General Assembly of United Nations, December 13 and 14, 1950, the Assembly adopted the following resolution, proposed by Australia, Canada, Ecuador, France, Netherlands, Turkey, United Kingdom, and the United States, that carried forward President Truman's suggestion that conventional and atomic weapons be considered in a joint disarmament commission: [28]

The General Assembly * * * decides to establish a committee of 12, consisting of representatives of the members of the Security Council as of 1 January 1951, together with Canada, to consider and report to the next regular session of the General Assembly on ways and means whereby the work of the Atomic Energy Commission and the Commission for Conventional Armaments may be coordinated and on the advisability of their functions being merged and placed under a new and consolidated disarmament commission.

Representatives of Canada, the United Kingdom, and the United States conferred in March 1950 at Chalk River, Ontario, on problems involved in the design and application of instruments for detecting and measuring radiations encountered in atomic energy work.[29] On

[26] Figures on imports and exports (unless otherwise indicated) compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.
[27] Bulletin of the Atomic Scientists, President Truman's Proposal for a New U. N. Disarmament Commission: Vol. 6, No. 11, November 1950, p. 343.
[28] Bulletin of the Atomic Scientists, vol. 7, No. 1, January 1951, p. 28.
[29] Atomic Energy Control Board, Ottawa, Canada, Press Release: Mar. 16, 1950, 1 p.

November 23, 1950, an announcement was issued that the Governments of Canada, the United Kingdom, and the United States had adopted a revised "Declassification Guide" that permitted publication of information necessary for the design, construction, and operation of low-power nuclear reactors used for research purposes.[30]

In December 1950 the Union of South Africa announced an agreement providing for the sale of uranium to the United States and the United Kingdom. (*See* Africa, below.)

A conference in Washington, D. C., on January 31, 1950, of representatives of Belgium, the United Kingdom, and the United States was reported by the Belgian foreign office.[31] Indications were that the conference dealt mainly with the production of uranium ore in the Belgian Congo.

On March 1, 1950, Dr. Klaus Julius Emil Fuchs, German-born scientist and chief physicist at the British atomic research plant at Harwell, England, pleaded guilty of violating the Official Secrets Act and was sentenced to 14 years in prison. Evidence showed that he had communicated valuable atomic information to Russian agents in Britain and in the United States, where he had worked on the Los Alamos project.[32] In September 1950 Prof. Bruno Pontecorvo, a nuclear scientist and the possessor of highly classified information obtained while engaged on atomic energy programs in England and the United States, defected to the U. S. S. R.[33]

WESTERN HEMISPHERE

Brazil.—Near the end of 1950 the Brazilian Chamber of Deputies approved a bill that provided for control by the National Security Council of the mining, beneficiation, and industrialization of certain minerals suitable for the development of atomic energy. Under the bill the export of uranium, thorium, and other atomic-energy minerals would be prohibited, except on a Government-to-Government basis.[34]

Discovery was reported of an extensive deposit of the uranium mineral djalmaite at São João d'el-Rey in Minas Gerais. The deposit was said to be about 4 miles long and ranging in width from 66 to 165 feet.[35]

Canada.—In 1950 the mine of the Crown company, Eldorado Mining & Refining (1944), Ltd., at Great Bear Lake, N. W. T., was again the source of virtually all the uranium ore produced in Canada. Operations of the company were at a new high level, with total tons of ore milled and sorted 29 percent higher than in 1949. Development footage and exploratory diamond drilling totaled 13,388 and 26,148 feet, respectively, compared with 10,600 and 14,590 feet in 1949. Estimates indicated that ore reserves were being maintained.[36]

Underground development continued in 1950 in the Goldfields area of Saskatchewan, on the north shore of Lake Athabaska, the so-called uranium "hot spot" in Canada. Principal operator in the area was Eldorado Mining & Refining (1944), Ltd., along the north shore of Beaverlodge Lake. Development by the company on its Ace and Eagle claims included the sinking of two shafts, 10,582 feet

30 Atomic Energy Control Board, Ottawa, Canada, Press Release: Nov. 23, 1950, 3 pp.
31 The Northern Miner, To Hold Conference on Uranium Ore: Vol. 35, No. 44, Jan. 26, 1950, p. 16.
32 New York Times, vol. 99, No. 33,640, Mar. 2, 1950, p. 1.
33 New York Times, vol. 100, No. 33,875, Oct. 23, 1950, p. 8.
34 Mining Journal (London), vol. 235, No. 6,019, Dec. 29, 1950, p. 635.
35 Mining World, vol. 11, No. 13, Dec. 1949, p. 58.
36 Eldorado Mining & Refining (1944), Ltd., Annual Report for the Year Ending Dec. 31, 1950: 18 pp.

of drifting and crosscutting, and 21,716 feet of diamond drilling.[37] At the property of Nicholson Mines, Ltd., on Nicholson Bay, along the north shore of Lake Athabaska, development was also extensive, and the prediction was made that the property would probably be the first privately owned and financed uranium mine in Canada to become productive.[38] Development and exploration were likewise actively in progress during 1950 in the Black Lake, Lac La Ronge, and Charlebois Lake areas in northern Saskatchewan.[39] The Montreal River area, in the Algoma district, 50 miles north of Saulte Ste. Marie, was the main center of exploration for uranium in the Province of Ontario in 1950;[40] the various deposits were described.[41] Exploration continued at Hottah Lake and Contact Lake in the Great Bear Lake area of Northwest Territories, and in British Columbia activity was centered in the New Hazelton area.

On April 17, 1950, announcement was made that the period of guaranteed price for radioactive ores had been extended from March 31, 1955, to March 31, 1958,[42] and on the following day a new pricing formula was announced, superseding that which had been in effect since April 1948. Under the new formula producers would be paid up to C$6 a pound for uranium oxide, as compared with a previous minimum price of C$2.75 a pound.[43] Published details on the application of the new formula included the following:[44]

> The formula devised to determine the price to be paid for uranium oxide takes into consideration unusual operating conditions and is based upon: (1) A price of $2.75 per pound for the uranium oxide content of the ore or mill feed; (2) a milling allowance of $7.25 per ton of ore milled; (3) a maximum allowable price, which is based on a mill head of 0.25 percent uranium oxide; (4) a minimum extraction of 70 percent. Eldorado will purchase, f. o. b. rail, concentrates at a price per pound of uranium oxide determined by the following formula:
>
> The price per pound to be paid for the U_3O_8 content (uranium oxide) of acceptable concentrates containing 10 percent or more by weight of U_3O_8 shall be the product obtained by multiplying the average number of pounds of U_3O_8 per ton of mill feed by $2.75 a pound, adding to this a milling allowance of $7.25 per ton of ore milled, and dividing the sum of the two by 70 percent of the average number of pounds of U_3O_8 per ton of mill feed.
>
> The maximum price per pound of U_3O_8, which will be paid, is that based upon the formula applied to an ore, with an average grade of 0.25 percent or 5 pounds per ton. This works out to $6 per pound.
>
> It will be necesary for each mine to make an individual contract with Eldorado specifying the price that is to be paid. Eldorado reserves the right to adjust the contract from time to time to bring it into conformity with actual operating results. In other words, if the grade of ore actually mined turned out to be different from that which was used in calculating the price for the uranium oxide, the price would be revised to conform with the grade of ore that was actually treated. At the panel discussion, Mr. Bennett indicated that the average grade would be calculated on a yearly basis.
>
> The formula is designed to encourage efficiency in ore dressing. The greater the recovery that is obtained, the more pounds of uranium oxide there will be in the concentrates that are sold and, hence, the greater will be the value per ton of the ore that is mined and milled.

---

[37] Stephens, F. H., Uranium "Hot Spot": Western Miner, vol. 23, No. 9, September 1950, pp. 41–46.
[38] Stephens, F. H., Nicholson Nears Production: Western Miner, vol. 23, No. 9, September 1950, pp. 49–51.
[39] The Precambrian, Development of Uranium Deposits Nears Stage of Plant Building for Production: Vol. 24, No. 1, January 1951, p. 33.
[40] Canadian Mining Journal, vol. 72, No. 2, February 1951, p. H 87.
[41] Nuffield, E. W., Geology of Part of Township 29, Range 14, District of Algoma: Ontario Dept. of Mines, Prelim. Rept. 1950–5, 6 pp.
[42] C. D. Howe, Minister of Trade and Commerce, speaking in the House of Commons, Ottawa, Ontario, Apr. 17, 1950.
[43] W. J. Bennett, president, Eldorado Mining & Refining (1944), Ltd., addressing the annual meeting of the Canadian Institute of Mining and Metallurgy, held in Toronto, Ontario, Apr. 17-19, 1950.
[44] Northern Miner, Government Gives Impetus to Uranium Production: Vol. 36, No. 4, Apr. 20, 1950, p. 5.

The price paid for uranium oxide includes all radioactive elements in the concentrates. Reimbursement will be made for other valuable metals that may be contained in the concentrates.

Mexico.—The Mexican Government was reported in 1950 to be investigating uranium deposits in the States of Chihuahua, Guerrero, and Oaxaca [45] and planning to erect a large plant for treating uranium ores.[46]

EUROPE

France.—Three uranium-mining centers in France were particularly active in 1950—Grury, in Saône et Loire; Lachaux, in Puy de Dôme, 25 kilometers southwest of Vichy; and La Crouzille, in Haute Vienne, 20 kilometers north of Limoges.[47] Mining operations reached a depth of 80 meters at Grury, and a fair tonnage of medium and low-grade ore was extracted. At Lachaux, a substantial tonnage of low-grade ore was mined, enough to warrant construction of mechanical-concentrating and chemical-processing plants. La Crouzille, where representatives of the Commissariat a l'Energie Atomique discovered a pitchblende deposit in 1948, was the main center of activity. On July 10, 1950, the first shaft at La Crouzille was placed in operation with appropriate ceremonies.[48] Continuity of the deposit was said to be remarkable. The new mine is 100 meters deep and equipped with a surface plant of the most-modern type for the recovery of uranium.

Italy.—Prospecting for uranium was active in Sardinia in 1950. The Mining Department of the Ministry of Industry and Commerce was reported prospecting a property in Calabria, southern Italy.[49] The Azienda Minerali Metallici Italiani was authorized by the Italian Government to start development of the uranium deposits in the Aosta Valley.[50] In Arbatax, Sardinia, uranium deposits were discovered and were to be taken over by a new organization, Societa Mineraria e Chemica per l'Uranio, of Milan.[51] Deposits of uranium reported to have been found south of Turin were to be examined by Italian Government representatives.[52]

Spain.—Discovery of radioactive ore was reported in 1950 at San Martin de Oscos in the Province of Oviedo, northwestern Spain,[53] and uranium was said to have been found at the Santa Matilde mine in the Province of Lerida.[54]

U. S. S. R.—A description of Soviet uranium mining in East Germany was issued on August 23, 1950, by the British Control Commission.[55] It stated that 300,000 Germans had been drafted by the Russians and the East German Government to mine ore. Operations were said to be on a 24-hour intensified basis aimed at producing a maximum of uranium regardless of wastage in manpower and material. Wismuth A. G., the Soviet monopoly that controls all uranium production in the Russian zone, was reported to have its own staff of secret police, immunity before all German courts, power of life or death over the

[45] Mining Journal, vol. 236, No. 5,984, Apr. 28, 1950, p. 428.
[46] Engineering and Mining Journal, vol. 151, No. 3, March 1950, pp. 134–136.
[47] Roubault, Marcel, [Uranium in the World]: Le Monde (Paris), Nov. 16, 17, and 18, 1950.
[48] Echo des mines et de la metallurgie, No. 3.423, August 1950, p. 346.
[49] Mining World, vol. 12, No. 5, May 1950, p. 54.
[50] Mining World, vol. 12, No. 10, September 1950, p. 25.
[51] Mining World, vol. 12, No. 12, November 1950, p. 49.
[52] Metal Bulletin (London), No. 3,536, Oct. 24, 1950, p. 17.
[53] Mining World, vol. 12, No. 3, March 1950, p. 54.
[54] Mining World, vol. 12, No. 8, July 1950, p. 49.
[55] Bulletin of the Atomic Scientists, Russian Uranium Procurement: Vol. 6, No. 10, October 1950, p. 318.

miners, authority to take over any village or property, and unlimited access to East German funds.

New uranium operations by the Russians in East Germany reported in 1950 included exploitation in the Katzhvette area, Province of Thüringia,[56] and the opening of a new mine near Weringerode in the Harz Mountains.[57] A concentrator was erected in 1950 at the Buhovo mine, situated about 18 miles from Sofia, Bulgaria. The mine is said to be the largest uranium producer in the Balkans.[58] A high-grade uranium deposit was reported to have been discovered about 35 miles southwest of Prague, Czechoslovakia,[59] and a number of new mines were said to be in operation in the Bohutice area in Bohemia.[60] Uranium deposits were discovered near the Polish border town of Goerlitz, southeast of Berlin.[61]

United Kingdom.—The Department of Scientific and Industrial Research announced in 1950 discovery of about a million tons of uraniferous black shale in north Wales.[62] The deposits, known as the Dolgelly black shales, are too low-grade to be economically important, containing 80 grams of U_3O_8 per ton, which is below the minimum content established by the Ministry of Supply.

AFRICA

Belgian Congo.—Early in 1950 the British Treasury sold 1,667,961 ordinary shares of Tanganyika Concessions, Ltd., to an Anglo-Belgian group; 600,000 of these shares were subsequently acquired by American interests. Tanganyika Concessions holds a 14.5-percent share interest, with 20 percent voting rights in Union Minière du Haut Katanga, operator of the Shinkolobwe mine in the Belgian Congo, the world's largest producer of high-grade uranium and one of the main sources of uranium metal used by the United States.[63]

Mozambique.—In 1947 a uranium-bearing titanium mineral, resembling davidite from Radium Hill, South Australia, was found at Mavuzi in the Tete district.[64] Uranium mineralization is distributed scantily over an area of about 300 square miles north of the community of Tete. Exploration at Mavuzi was undertaken jointly by the British South Africa Co., New Consolidated Gold Fields, Ltd., and Gold Fields Rhodesian Development Co., Ltd. About 150 tons of ore assaying up to 8 percent U_3O_8 were produced, the largest part being sold in France.[65]

Nigeria.—Monazite and thorite (thorium silicate containing 50–70 percent ThO_2) occur as minor constituents in the placer-tin deposits. In 1949 the United Kingdom Ministry of Supply announced a guaranteed price, effective for 10 years, at which it would buy thorium mineral concentrates: For concentrates sold as monazite a basic price of £50 per long ton, f. o. b. Jos or Dukura, bagged, combined monazite and thorite content not less than 95 percent, a £3 bonus to be added for each percent by which the thoria (ThO_2) content exceeds

[56] Mining World, vol. 12, No. 8, July 1950, p. 49.
[57] Mining World, vol. 12, No. 4, April 1950, p. 44.
[58] Engineering and Mining Journal, vol. 151, No. 9, September 1950, p. 142.
[59] Mining World, vol. 12, No. 1, January 1950, p. 52.
[60] Mining Journal, vol. 234, No. 5,970, Jan. 20, 1950, p. 70.
[61] Chemical and Engineering News, vol. 28, No. 14, Apr. 3, 1950, p. 1124.
[62] Engineering and Mining Journal, vol. 151, No. 10, October 1950, p. 150.
[63] Mining Journal (London), May 1951, p. 177.
[64] Bannister, F. A., and Horne, J. E. T., A Radioactive Mineral from Mozambique Related to Davidite: Mineralog. Mag., vol. 29, No. 209, June 1950, pp. 101–112.
[65] Davidson, C. F., and Bennett, J. A. E., The Uranium Deposits of the Tete District, Mozambique: Mineralog. Mag., vol. 29, No. 211, December 1950, pp. 291–303.

6 percent; for concentrates sold as thorite, payment of £6 10s. for each percent ThO_2, minimum of 15 percent ThO_2, additional consideration to be made for abnormally high uranium content.[66] Despite the foregoing purchase guarantee, there was little resultant production of either thorite or monazite, the prices offered being too low to cover the cost of recovery.[67]

Union of South Africa.—In December 1950 an agreement was concluded by representatives of the United States, United Kingdom, and the Union of South Africa for the recovery of uranium as a byproduct in the processing of South African gold ores and for the sale of the uranium to the United States and the United Kingdom. The agreement marked successful completion of several years' intensive research and development by the three nations on the problem of recovering uranium economically from the gold ores. Although the uranium content of the ores is small, potential production of uranium is relatively large because of the great quantity of ore processed. Mining companies initially engaging in the project are West Rand Consolidated Mines, Ltd., Daggafontein Mines, Ltd., Blyvooruitzicht Gold Mining Co., Ltd., and Western Reefs Exploration & Development Co., Ltd. Design and construction of uranium-recovery plants will proceed on an expedited basis under the agreement. Negotiations leading to the agreement were a continuation of those held a year previously.[68]

ASIA AND AUSTRALIA

Australia.—Near the end of 1950, the Mines Department announced that a £A50,000 program would soon be undertaken at the Radium Hill deposit near Olary, South Australia, said to be the most important uranium occurrence in the Commonwealth. Plans included thorough testing of the ore, installation of a sampling mill, development of concentrating processes, and erection of a pilot plant, to be followed by commercial exploitation of the deposit. During 1950 the Commonwealth Government explored and drilled a number of deposits discovered in several different regions of Australia, including those found in the Rum Jungle field near Darwin in Northern Territory.[69] A lode deposit containing torbernite was discovered along the main north-south road at Fergusson River, 176 miles south of Darwin, and was judged to be one of the more significant discoveries made in the Territory.[70]

India.—The Government of India announced in April 1950 that rewards would be paid for the discovery of deposits of uranium ore in India. The new deposits would have to be at least 100 miles from already-known deposits. Such new deposits, if capable of producing 100 tons of uranium oxide in ore that assays not less than 0.4 percent U_3O_8, will command a reward up to Rs. 10,000. Grants-in-aid for mine development were made available to applicants who produce and deliver not less than 20 tons of uranium ore from a concession or mining lease not previously worked for uranium.

[66] Williams, Harris H., Third Quarterly Report for Nigeria: American Consulate General, Lagos, Nigeria, Consular Rep. 112, Oct. 8, 1949, pp. 2–4.
[67] Geological Survey Department, Annual Report for the year 1949–50: Kaduna, Nigeria, 1951, p. 9.
[68] U. S. Department of State Bulletin, United States, United Kingdom, and South Africa Reach Agreement on Uranium Production: Vol. 24, No. 600, Jan. 1, 1951, pp. 28–29.
[69] Mining World, vol. 12, No. 13, December 1950, pp. 41–43.
[70] Industrial and Mining Standard, Radioactive Minerals in Northern Territory: Vol. 105, No. 2,682, Oct. 5, 1950, p. 17.

On July 11, 1950, the Government of India announced its decision to purchase all stocks of uranium in India in the hands of dealers or mine owners. A minimum uranium content equivalent to 10 percent by weight of uranium oxide in the ores or concentrates will normally be required. Payment will be made at the minimum rate of Rs. 9 per pound of contained uranium oxide, f. o. b. station of despatch, and the rate will be guaranteed for 5 years. Consideration will be given to the commercially recoverable value of any associated mineral constituents of the ores. The announcement pointed out that under the Atomic Energy Act XXIX of 1948 uranium was a "prescribed" mineral and could be compulsorily acquired by the Government, and that it would therefore be advantageous for dealers and mine owners or persons possessing stocks of uranium to sell such stocks to the Government of India at an early date.

SELECTED BIBLIOGRAPHY

GEOLOGY

BAIN, GEORGE W. Geology of the Fissionable Materials. Econ. Geol., vol. 45, No. 4, June–July 1950, pp. 273–323.

FISCHER, R. P. Uranium-Bearing Sandstone Deposits of the Colorado Plateau. Econ. Geol., vol. 45, No. 1, January–February 1950, pp. 1–11.

MCKELVEY, V. E., and NELSON, J. M. Characteristics of Marine Uranium-Bearing Sedimentary Rocks. Econ. Geol., vol. 45, No. 1, January–February 1950, pp. 35–53.

RIDLAND, G. C. Radioactivity at the Caribou Silver Mine, Boulder County, Colo. Min. Eng., vol. 187, No. 1, January 1950, pp. 98–101.

ROBINSON, R. F. Discussion on Uraninite in the Coeur d'Alene District, Idaho. Econ. Geol., vol. 45, No. 8, December 1950, pp. 818–819.

THURLOW, E. E., and WRIGHT, R. J. Uraninite in the Coeur d'Alene District, Idaho. Econ. Geol., vol. 45, No. 5, August 1950, pp. 395–404.

MINERALOGY

DAVID, T. W. E. Cerium and Thorium. Geol. Commonwealth of Australia, Arnold Press, London, vol. 2, pt. 3, 1950, pp. 316–317.

——— Uranium and Radium. Geol. Commonwealth of Australia, Arnold Press, London, vol. 2, pt. 3, 1950, pp. 314–316.

FRONDEL, A. W., and FLEISCHER, MICHAEL. A Glossary of Uranium and Thorium Bearing Minerals. Geol. Survey Circ. 74, April 1950, 20 pp.

ROBINSON, S. C. Mineralogy of the Goldfields District, Saskatchewan. Canada Geol. Survey Paper 50–16, 1950, 38 pp.

SRINIVASAN, N. R. Uranium Minerals of India. Current Science (India), vol. 19, No. 5, May 1950, pp. 141–142.

MEASUREMENT OF RADIOACTIVITY

LESTER, J. G. The Geiger-Muller Counter in Geologic Work. Georgia Geol. Survey Bull. 56, 1950, pp. 112–117.

PRINGLE, R. W. The Scintillation Counter. Nature (London), vol. 166, No. 4209, July 1, 1950, pp. 11–14.

ROHRER, R. H. A Portable High-Speed Geiger Counter for Geologic Surveys in Georgia. Georgia Geol. Survey Bull. 56, 1950, pp. 117–129.

SIMPSON, D. J., and BOUER. R. F. Radioactivity Logging. Trans. Geol. Soc. South Africa, vol. 53, 1950.

DETERMINATION OF URANIUM AND THORIUM

ASSELIN, G. F. The Separation of Thorium and Rare Earth Salts by Solvent Extraction. Jour. Phys. and Coll. Chem., vol. 54, No. 5, May 1950, pp. 640–648.

DICKSON, BRENTON H., and KAUFMAN, DAVID. Determination of Thorium in Low-Grade Ores. Atomic Energy Commission Rept. AECD–2887, Mar. 10, 1950, 21 pp.

GRIMALDI, F. S., and MARSH, CHARLOTTE A. Determination of Thorium in High-Grade and Low-Grade Ores. Atomic Energy Commission Rept. AECD–2818, Sept. 29, 1950, 17 pp.

RABBITTS, F. T. Determination of Uranium in Ores; Review of Chemical Methods. Canada Dept. Mines Tech. Survey, Memoir Ser., No. 109, 1950, pp. 1–13.

RODDEN, C. J., and TREGONING, J. J. Manual of Analytical Methods for the Determination of Uranium and Thorium in Their Ores. Atomic Energy Commission, September 1950, 55 pp.

MINERAL PROCESSING

COLEMAN, C. F. Studies of Recovery Processes for Western Uranium-Bearing Ores, Part 5: Tests of Specific Leaching of Carnotite Ores. Atomic Energy Commission Rept. AECD–2846, July 14, 1950, 16 pp.

CROUSE, DAVID J., and BROWN, K. B. Studies of Recovery Processes for Western Uranium-Bearing Ores, Part 7: Wet Concentration. Atomic Energy Commission Rept. AECD–2849, June 28, 1950, 34 pp.

HULEATT, WILLIAM P. Automatic Sample Preparation Saves Time, Money for USGS. Eng. and Min. Jour., June 1950, pp. 62–67.

Vanadium

By Hubert W. Davis

GENERAL STATEMENT

FOR security reasons, publication of figures on production and consumption of vanadium ore in the United States since 1947 has been suspended.

DOMESTIC PRODUCTION

The center of domestic vanadium-ore mining in the United States is the Colorado-Utah region. Small outputs are made in Arizona, Nevada, and New Mexico, and vanadium-bearing phosphate rock is mined in Idaho.

TABLE 1.—Vanadium in ores and concentrates produced in the United States, 1938–47 [1]

Year	Pounds	Year	Pounds
1938	1,613,155	1943	5,586,492
1939	1,984,068	1944	3,527,054
1940	2,162,916	1945	2,963,913
1941	2,513,051	1946	1,272,148
1942	4,439,130	1947	2,117,962

[1] Data for 1940–47 are receipts at mills and Government purchasing depots.

USES

About 90 percent of the vanadium used is consumed as ferrovanadium in the manufacture of tool steels, engineering steels, high-strength structural steels, non-aging rimming steels,[1] and special wear-resistant cast irons. Some ferrovanadium is used in welding-electrode coatings and as a deoxidizer, and some metal is utilized in magnets. Some vanadium oxide is also used in the production of tool steel. The largest uses of vanadium oxide and ammonium metavanadate are as catalysts, in glass and ceramic glazes, for driers in paints and inks, and for laboratory research. Ductile vanadium, 99.8 percent pure, was made available in 1950.[2]

PRICES

For many years vanadium ore has been quoted at 27½ cents a pound of contained V_2O_5. This quotation, however, disregards the grade of the ore or the presence or absence of objectionable impurities—matters

[1] Epstein, S., and others, Vanadium-Treated, Non-aging Rimming Steel for Deep Drawing Quality Sheet: Jour. Metals, vol. 188, No. 6, June 1950, pp. 830–834.
Epstein, S., and Frame, J. W., New Vanadium Steel for Deep Drawing Sheets: Iron Age, vol. 166, No. 15, Oct. 12, 1950, pp. 158–163.
[2] Iron Age, Pure Vanadium Now in Limited Production: Vol. 166, No. 14, Oct. 5, 1950, pp. 95–96.

important to the refiners, inasmuch as impurities vitally affect recovery. Throughout 1950 vanadium pentoxide (technical grade) was quoted at \$1.00 to \$1.06 a pound of V_2O_5 and ferrovanadium at \$3.10 to \$3.25 a pound of contained vanadium (depending upon the grade of the alloy).

FOREIGN TRADE [3]

Imports of vanadium concentrates (all from Peru) were 1,457,010 pounds (contained vanadium) in 1950, an increase of 164 percent over 1949. Flue dust containing 804 pounds of vanadium was received from Venezuela in 1950 (none in 1949). Imports of ferrovanadium were 130,022 pounds (gross weight) valued at \$91,193 in 1950 (none in 1949) and comprised 34,237 pounds from United Kingdom and 95,785 pounds from Japan. Vanadium ore and concentrates enter the United States free of duty. However, the rate of duty on ferrovanadium is 12½ percent ad valorem and on vanadic oxide, anhydride, salts, and compounds and mixtures of vanadium, 40 percent ad valorem.

TABLE 2.—Vanadium ore or concentrates and vanadium-bearing flue dust imported for consumption in the United States, 1941–50

Year	Vanadium ore or concentrates			Vanadium-bearing flue dust		
	Pounds		Value	Pounds		Value
	Gross weight	Vanadium content		Gross weight	Vanadium content	
1941	24,645,686	2,138,608	\$1,012,991	(1)	(1)	(1)
1942	36,492,268	2,422,376	1,274,483	624,423	154,028	\$29,545
1943	22,117,131	2,052,620	1,080,150	748,749	64,393	53,553
1944	4,247,490	1,284,603	633,719	191,901	40,171	28,059
1945	8,776,328	1,550,479	725,362	133,795	26,293	19,378
1946	2,784,349	791,057	390,077	97,750	20,931	13,480
1947	3,274,548	983,869	448,076	143,124	71,819	15,483
1948	4,034,509	1,051,675	534,374			
1949	2,028,980	551,337	272,124			
1950	5,110,403	1,457,010	708,806	9,575	804	2,475

[1] Not separately recorded.

Exports of vanadium ore and concentrates totaled 963 pounds (contained vanadium) valued at \$2,615 in 1950 compared with 13,130 pounds (corrected figure) valued at \$26,266 in 1949. The 1950 exports comprised 476 pounds to Canada and 487 pounds to Hong Kong. Exports of ferrovanadium totaled 82,449 pounds (gross weight) valued at \$183,307 in 1950 compared with 194,655 pounds valued at \$350,558 in 1949. The 1950 exports comprised 30,462 pounds to Canada and 51,987 pounds to Austria. Exports of vanadium metal, alloys, and scrap were 4,106 pounds valued at \$2,688 in 1950 compared with 2,754 pounds valued at \$17,851 in 1949. The 1950 exports comprised 139 pounds to Canada and 3,967 pounds to Italy.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

WORLD REVIEW

World production of vanadium ores is limited almost entirely to four countries—Northern Rhodesia, Peru, South-West Africa, and the United States. From 1941 through 1947 output from these sources ranged from 1,400 to 4,400 metric tons, with the United States the leading producer.

Vanadium has also been recovered commercially from phosphate rock, iron ore, chrome ore, magnetite beach sands, caustic soda solution employed in the Bayer process of refining bauxite, naphtha soot collected from the smokestacks of ships and industrial plants, and vanadiferous ashes derived from asphaltites.

Because complete information on the quantity of vanadium recovered as byproducts of iron ore and other raw materials is lacking, it is not possible to determine world production of vanadium from all sources. Consequently, table 3 reflects only the production of vanadium in ores and concentrates for the countries listed plus the quantity recovered in the United States as a byproduct of phosphate rock.

TABLE 3.—World production of vanadium in ores and concentrates, 1941–50, in metric tons

[Compiled by Berenice B. Mitchell]

Country	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Argentina	6	------	------	4	3	6	7	(1)	(1)	(1)
Mexico	(2)	------	------	------	------	------	------	------	------	------
Northern Rhodesia	342	388	426	254	219	68	56	173	153	------
Peru	1,017	1,010	847	514	688	322	435	511	456	436
South-West Africa	269	453	577	385	420	430	282	187	163	295
United States (shipments) [3]	1,140	2,014	2.534	1,600	1,344	577	961	(4)	(4)	(4)
Total [5]	2,774	3,865	4,384	2,757	2,674	1,403	1,741	(4)	(4)	(4)

[1] Figure not available.
[2] Less than 1 ton.
[3] Includes also vanadium recovered as a byproduct of phosphate-rock mining.
[4] Bureau of Mines not at liberty to publish figure.
[5] Total represents data only for countries shown in table and excludes vanadium in ores produced in French Morocco, Spain, and U. S. S. R., for which figures are not available; the total also excludes quantities of vanadium recovered as byproducts from other ores and raw materials.

Northern Rhodesia.—The Rhodesia Broken Hill Development Co., Ltd., is the only producer of vanadium in Northern Rhodesia. There was no production in 1950, although shipments were made from stock. Output of vanadium oxide was 293 long tons averaging 91.89 percent V_2O_5 in 1949.

Peru.—The famous Mina Ragra mine of the Vanadium Corp. of America in the Andes near Ricran, Department of Junin, has been an important source of vanadium since 1907, when production was begun. Output in Peru was 779 metric tons of V_2O_5 in 1950 compared with 814 tons of V_2O_5 in 1949.

South-West Africa.—The Abenab West lead-vanadium mine of the South-West Africa Co., Ltd., was the chief producer of vanadium in South-West Africa in 1950. Some was also produced by P. Weidner. Output of ore and concentrates (V_2O_5 content) was 580 short tons in 1950 compared with 320 tons in 1949. Exports of ore and concentrates (V_2O_5 content) were 756 short tons, of which 66 tons went to Belgium, 147 tons to France, 251 tons to the United Kingdom, and 292 tons to the Netherlands. The flotation plant of the company commenced operation May 1, 1950.

Zinc[1]

By Richard H. Mote and Esther B. Miller

GENERAL SUMMARY

RESPONDING to the demand generated by the outbreak of Korean hostilities and acceleration of the National Defense Program, the zinc industry produced a greater quantity of slab zinc in 1950 than in any prior year in the peacetime history of the United States. Output totaled 910,437 short tons, including 65 percent from domestic ores, 28 percent from foreign ores, and 7 percent from secondary sources. Domestic mine production of recoverable zinc rose 5 percent over 1949 to total 623,375 tons but was well below the World War II average (719,000 tons per year). Imports of zinc contained in ore and concentrates increased 13 percent to 272,538 tons and imports of slab zinc rose almost 23 percent to 155,974 tons.

Despite the record production and high level of imports the slab-zinc supply in 1950 was insufficient to fill all demands. Stocks at primary and secondary smelters were reduced 91 percent during the year to less than 9,000 tons on December 31, the smallest reserve since November 1925. Consumers' inventories were also reduced during the year and on December 31 were 26 percent under the quantity on hand on January 1.

The stringent supply situation prevalent throughout most of the year was reflected in increases in the price of slab zinc. The quotation for Prime Western grade zinc at East St. Louis ranged between 9.75 and 10.00 cents per pound during the first quarter of 1950. Beginning March 27, the price began to rise, and every change thereafter was upward until September 7, when it reached 17.50 cents, where it remained for the balance of the year.

[1] This report deals primarily with the smelter branch of the industry. Fuller details of zinc mining are given in the various State reports of this volume. As some zinc ore is used directly in the manufacture of zinc pigments, *see also* the chapter on Lead and Zinc Pigments and Zinc Salts.

TABLE 1.—Salient statistics of the zinc industry in the United States, 1941–45 (average) and 1946–50

	1941–45 (average)	1946	1947	1948	1949	1950
Production of primary slab zinc:						
By sources:						
From domestic ores.........short tons..	583,669	459,205	510,058	537,966	591,454	588,291
From foreign ores.................do....	274,344	269,057	292,437	249,798	223,328	255,176
Total..............................do....	858,013	728.262	802,495	787,764	814,782	843,467
By methods:						
Electrolytic...........percent of total..	33	39	37	40	40	41
Distilled............................do....	67	61	63	60	60	59
Production of redistilled secondary slab zinc..............................short tons..	51,838	44,516	59,542	62,320	55,041	66,970
Stocks on hand at primary smelters Dec. 31.........................short tons..	152,645	175,513	67,046	19,179	[1] 90,710	7,920
Price:						
Prime Western at St. Louis:						
Average for period...cents per pound..	8.10	8.73	10.50	13.58	12.15	13.88
Highest quotation.................do....	8.25	10.50	10.50	17.50	17.50	17.50
Lowest quotation..................do....	7.25	8.25	10.50	10.50	9.00	10.00
Yearly average at London..........do....	4.74	7.75	12.58	14.38	14.41	14.89
Mine production of recoverable zinc [2] short tons..	718,869	574,833	637,608	629,977	593,203	623,375
Tri-State district (Joplin) percent of total..	28	24	17	14	13	13
Western States......................do....	43	48	54	58	60	59
Other...................................do....	29	28	29	28	27	28
World smelter production of zinc short tons..	1,831,000	1,528,000	1,758,000	1,872,000	1,996,000	2,142,000

[1] Revised figure.
[2] Includes Alaska.

GOVERNMENT REGULATIONS

Government controls over the zinc industry were introduced in the latter part of the year. Inventories were controlled by National Production Authority Regulation No. 1, effective September 18, 1950, and NPA Notice No. 1, effective December 27, 1950. NPA Regulation No. 1, designed to prevent accumulation of excessive inventories of materials in short supply, limited the quantities of such materials in stock to a practicable minimum working inventory. Zinc items covered by this regulation included slab zinc, zinc-base alloy, zinc dust, zinc oxide, and zinc and zinc-base alloy scrap. NPA Notice 1, issued to prevent hoarding of strategic materials, prohibited the accumulation, exceeding reasonable demands of business or for resale at prices over prevailing market prices, of certain designated materials, including slab zinc, zinc-base alloy, all zinc products (such as rolled and extruded shapes, wire, and castings), and zinc and zinc-base alloy scrap.

Priority ratings for defense orders were established in several regulations issued by the NPA. Regulation No. 2, effective October 3, 1950, authorized the assignment of a "defense-order" or "DO" rating to defense orders and gave priority to such orders. NPA Order M-9, effective November 16, 1950, applied particularly to producers and fabricators of zinc and dealers in zinc and zinc products. Under this order a producer of zinc, zinc dust, or zinc oxide was not required to accept rated orders for shipment in any one month in excess of 10 percent of his production. A fabricator of zinc-base alloys was not required to accept rated orders in any one month exceeding 20 percent of his average monthly shipments of products during the first 8 months of 1950. Similarly, fabricators of sheet zinc, strip zinc, zinc wire, zinc rod, zinc shapes, and zinc plate were not required to accept orders exceeding 15 percent of the average monthly shipments of such products during the first 8 months of 1950. A dealer was not required to accept rated orders for shipment in any one month of a total tonnage that exceeded 15 percent of the total quantity available to him during the month. The order further stipulated that producers and fabricators were not required to accept rated orders received less than 30 days before the first day of the month in which shipment was requested.

NPA Order M-15, restricting civilian use of zinc metal and zinc metal products, was issued effective December 1, 1950, and limited civilian consumers of zinc metal and zinc-metal products during 1951 to an average quarterly rate of 80 percent of the use during the first 6 months of 1950. The order further specified that inventories were to be held to a 45-day supply or a "practicable minimum working inventory," whichever was less.

DOMESTIC PRODUCTION

Statistics on zinc production are compiled both on a mine basis and on a smelter basis. The mine-output data, based upon the zinc content of ores and concentrates produced (adjusted to account for average smelting losses), form an accurate measure of domestic zinc output from year to year. Smelter production of slab zinc from domestic ores represents a more accurate figure of actual zinc recovery but usually differs from the mine figure owing to a time-lag between mine or mill shipments and smelter production. Over a period of years, these variations tend to balance out within the limits of statistical error.

MINE PRODUCTION

Zinc mining in the United States is centered largely in five areas—the Tri-State area of southeastern Kansas, southwestern Missouri, and northeastern Oklahoma; Tennessee-Virginia; Sussex County, N. J.; St. Lawrence County, N. Y.; and the Western States (principally Idaho, Montana, Arizona, Colorado, Utah, New Mexico, Nevada, and Washington, in descending order of production in 1950).

Mine production in the combined Western States increased 3 percent in 1950 compared with 1949. Almost 59 percent of the total domestic output of zinc in 1950 (60 percent in 1949) was produced in the Western States.

Idaho continued to be the largest producer of zinc in the United States, about 98 percent of the State total in 1950 coming from the Coeur d'Alene region and most of the remainder from the Warm Springs district. Zinc-lead ore and old tailings concentrated yielded 91 percent of the State total zinc; old zinc slag smelted and fumed, 5 percent; and zinc ore concentrated and lead ore concentrated, 3 percent. The Star mine near Burke in the Coeur d'Alene region remained the largest Idaho zinc producer; it was followed by the Page, Morning, Bunker Hill and Sullivan, Sidney, Frisco, Bunker Hill slag dump, Spokane-Idaho, and Tamarack. These nine properties supplied 83 percent of Idaho's total zinc in 1950.

Owing to a record high output at the Butte Hill mines and dumps of the Anaconda Copper Mining Co., Montana zinc production advanced 25 percent in 1950 to 67,678 tons, which placed the State second among the zinc-producing States, a position unattained since 1920. During 1950 Anaconda company-owned operations at Butte supplied 79 percent of the State's zinc output. Other important zinc producers during the year were the Emma mine, East Helena old slag dump, the Travona mine in Silver Bow County, and the Mike Horse property at Flesher in Lewis and Clark County. These five operations produced nearly 99 percent of the State total zinc output. Of Montana zinc in 1950, 96 percent was derived from zinc-lead ore, nearly 4 percent from zinc ore and old slag, and the small remainder from gold, silver, lead, and copper ores.

Arizona zinc output in 1950 declined 14 percent from the record attained in 1949 owing largely to a smaller production of zinc-lead ore from the Copper Queen mine at Bisbee. Although zinc output at the Copper Queen mine dropped 41 percent, the property remained the largest producer in Arizona. Other important producers of zinc, in order of output, were the Iron King mine at Humboldt, United Verde branch of the Phelps Dodge Corp. at Jerome, San Xavier mine near Sahuarita, St. Anthony property at Tiger, Flux group near Patagonia, Magma mine in Pinal County, Republic & Mammoth mine at Dragoon (Coronado Copper & Zinc Co.), and Old Dick property at Bagdad. More than 77 percent of the State total zinc came from zinc-lead ore and most of the remainder from zinc, zinc-copper, and zinc-lead-copper ores.

TABLE 2.—Mine production of recoverable zinc in the United States, 1941–45 (average) and 1946–50, by States, in short tons

State	1941–45 (average)	1946	1947	1948	1949	1950
Western States and Alaska:						
Alaska			25	22	2	6
Arizona	24,799	43,665	54,644	54,478	70,658	60,480
California	4,257	6,877	5,415	5,325	7,209	7,551
Colorado	33,552	36,147	38,745	45,164	47,703	45,776
Idaho	85,577	71,507	83,069	86,267	76,555	87,890
Montana	41,312	16,770	45,679	59,095	54,195	67,678
Nevada	16,226	22,649	16,970	20,288	20,443	21,606
New Mexico	46,974	36,103	44,103	41,502	29,346	29,263
Oregon			1		6	21
South Dakota	43		19	29		
Texas		44	22			
Utah	41,422	28,292	43,673	41,490	40,670	31,678
Washington	12,904	11,329	13,800	12,638	10,740	14,807
Total	307,066	273,383	346,165	366,298	357,527	366,756
West Central States:						
Arkansas	161	85	18	31	1	8
Kansas	59,264	47,703	41,497	35,577	29,433	27,176
Missouri	29,508	22,234	17,074	6,463	5,911	8,189
Oklahoma	117,589	69,552	51,062	43,821	44,033	46,739
Total	206,522	139,574	109,651	85,892	79,378	82,112
States east of the Mississippi River:						
Illinois	8,002	8,798	10,073	12,980	18,157	26,982
Kentucky	458	314	508	639	935	731
New Jersey	88,473	64,454	76,871	76,332	50,984	55,029
New York	38,154	32,515	34,116	34,566	37,973	38,321
Tennessee	39,312	24,614	31,212	29,524	29,788	35,326
Virginia	18,650	16,905	16,788	15,882	13,166	12,396
Wisconsin	12,232	14,276	12,224	7,864	5,295	5,722
Total	205,281	161,876	181,792	177,787	156,298	174,507
Grand total	718,869	574,833	637,608	629,977	593,203	623,375

TABLE 3.—Mine production of recoverable zinc in the United States,[1] 1949–50, by months, in short tons

Month	1949	1950	Month	1949	1950
January	51,966	43,808	August	45,289	56,487
February	53,235	46,327	September	42,268	54,858
March	62,395	51,999	October	39,219	55,937
April	59,571	49,319	November	42,447	55,432
May	56,304	52,166	December	46,019	57,493
June	54,557	50,874			
July	39,933	48,675	Total	593,203	623,375

[1] Includes Alaska.

Zinc production in Colorado declined slightly in 1950 after 4 years of successive increases. In Summit County at Kokomo, depletion of ore reserves in the Victory-Lucky Strike-Wilson-McKinley group of mines caused this large producer to close April 19. The subsequent decrease in Summit County's zinc output was partly offset by expanded production in Eagle, San Miguel, and Lake Counties and reopening in July of the Rico Argentine mine in Dolores County, closed since May 1949. The leading zinc producers, in order of rank, were the Eagle mine, Eagle County; Treasury Tunnel-Black Bear (Idarado) group, San Miguel County; Resurrection group, Lake County; Victory (American Smelting & Refining Co. Kokomo unit), Summit County; and Smuggler Union-Montana group, San Miguel County. Zinc, zinc-lead, and zinc-lead-copper ores yielded 93 percent of the Colorado total zinc in 1950.

Utah zinc output in 1950 decreased 22 percent from that in 1949 and was the smallest since 1946. This loss resulted mainly from the closing during part of the year of the United States & Lark property at Bingham and from reduced zinc output of mines in the Park City, Ophir, and Rush Valley (Stockton) districts. The Lark mine was shut from July 16 through October 28 because of a fire in the lower levels; the United States mine was idle 2 months owing to a labor strike. Despite the fire and labor difficulties that lowered zinc output in 1950 about 27 percent under 1949, the United States & Lark property remained by far the largest producer of zinc in Utah.

It was followed by the properties of the Chief Consolidated Mining Co., Park Utah Consolidated Mines Co., New Park Mining Co., Butterfield group, and Honorine, Cardiff, Hidden Treasure, and Calumet mines. These nine properties supplied 97 percent of the Utah total zinc in 1950. Over 97 percent of the State total zinc was recovered from zinc-lead ore.

Most New Mexico mines that had closed in 1949 as a result of the decline in the price of zinc metal reopened in 1950. In the Central district, the New Mexico Consolidated Mines Co. Kearney mine resumed operations February 27; the Kennecott Copper Corp. Oswaldo mine, the American Smelting & Refining Co. Ground Hog, and the United States Smelting, Refining & Mining Co. Bayard group reopened in June; and the Peru Mining Co. Pewabic mine reopened October 16. The Hanover mine and mill of the New Jersey Zinc Co., Empire Zinc Division, which had operated throughout 1949, were closed by a work stoppage October 17, 1950, and remained idle the balance of the year. The principal New Mexico producers of zinc in 1950, in order of output, were the Kearney, Hanover (Empire Zinc), Ground Hog, Oswaldo, and Bayard groups. Nearly 94 percent of the State total zinc in 1950 was recovered from zinc ore.

Nevada zinc production in 1950 was 6 percent greater than in 1949. Most of the output was centered in the Pioche district, Lincoln County, where zinc and zinc-lead ores mined and concentrated were the source of 91 percent of the State total zinc. Rising zinc prices in 1950, especially after midyear, made possible movement to a Utah slag-fuming plant of notable tonnages of oxidized zinc ore, largely from mines in Clark, Eureka, and White Pine Counties and from the former Metals Reserve Co. World War II stockpile of Clark County ore at Jean, Nev. Leading Nevada producers of zinc included the Combined Metals Reduction Co. Pioche group and Ely Valley Mines, Inc., Ely Valley mine, both in the Pioche district, Lincoln County; the Copper Canyon Mining Co. Copper Canyon mine, Battle Mountain district, Lander County; and the L. F. Jacobson Yellow Pine mine, Yellow Pine district, Clark County. Over 78 percent of the Nevada total zinc in 1950 was recovered from zinc-lead ore and most of the remainder from zinc ore.

Recoverable zinc production in Washington in 1950 reached the highest level on record, owing mainly to a marked increase in tonnage of zinc-lead ore milled at the Grandview mine. The Grandview property replaced the Pend Oreille mine as the State's leading zinc producer; it was followed by the Holden and Deep Creek and Anderson mines. These properties supplied nearly 99 percent of the State total zinc. Zinc-lead ore supplied over 74 percent of the total zinc in 1950, zinc-copper ore 16 percent, and zinc ore nearly 9 percent.

California zinc production in 1950 exceeded the previous years' yield by a small margin. The Anaconda Copper Mining Co. Darwin group of mines dominated the State output and was followed, in second place, by the Coronado Copper & Zinc Co. Afterthought mine, Shasta County, which resumed operation in August 1950 after over 1 year of inactivity. In addition, the Anaconda Copper Mining Co. Shoshone group; the Penn Chemical Co. Penn mine, Campo Seco district, Calaveras County; and the J. Q. Little Carbonate King zinc mine, Ivanpah district, San Bernardino County—the latter a shipper of oxidized zinc ore to a slag-fuming plant—contributed to the State total recoverable zinc. Over 65 percent of the California output in 1950 was derived from zinc-lead ore, 23 percent from zinc ore, and the remainder from lead ore.

In Oregon a small tonnage of zinc was recovered from ores from the Bohemia district, Lane County.

Zinc production in the Tri-State district, which has been declining since 1942, advanced slightly in 1950 as a result of increased zinc and lead concentrate prices during the latter half of 1950. Output lagged during the first quarter of the year, when concentrate prices were low. In the second quarter zinc prices improved somewhat, while lead prices remained low, causing district ore production to rise about 5 percent. Continued advances in prices for zinc and lead concentrates resulted in a 31-percent increase in mine output during the latter half of the year compared with the first half. The five principal zinc producers in the Tri-State district in 1950, in order of output, were: Eagle-Picher Mining & Smelting Co. (Oklahoma and Kansas); Nellie B. Mining Co. (Oklahoma); National Lead Co., St. Louis Smelting & Refining Division (Kansas); Federal Mining & Smelting Co. (Oklahoma and Missouri); and Dale Mining Co. (Missouri).

Zinc production from mines in the States east of the Mississippi River increased 12 percent over 1949 in 1950. Production was re-

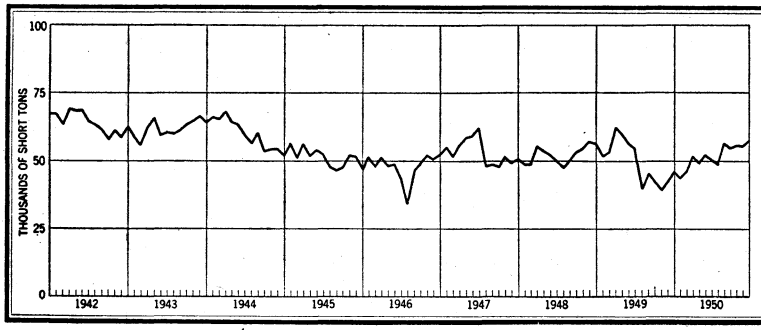

FIGURE 1.—Mine production of recoverable zinc in the United States, 1942–50, by months, in short tons.

ported in Illinois, Kentucky, New Jersey, New York, Tennessee, Virginia, and Wisconsin. The principal producer was again the New Jersey Zinc Co., operating the Franklin and Sterling Hill mines in New Jersey and the Austinville mine in Virginia. In Kentucky and Southern Illinois, zinc is produced chiefly as a byproduct or coproduct with fluorspar. The principal producers in this area were the Ozark-Mahoning Co. and the Minerva Oil Co. During the latter part of the year the Alcoa Mining Co. began producing and concentrating zinc ore from its newly developed Hutson mine in Kentucky. Output from the Kentucky-Southern Illinois area was 2 percent greater in 1950 than in 1949. New Jersey production was 8 percent greater than in 1949. Franklin and Sterling Hill, the two producing mines, operated continuously after resumption of work with the ending of a labor strike at the Palmerton, Pa., zinc smelter January 26. New York mines produced about the same quantity of zinc as in 1949, despite closing of the Universal Exploration Co. Hyatt mine on May 15. Other producers in New York during 1950 were the Balmat and Edwards mines, operated by the St. Joseph Lead Co. In Tennessee, zinc output increased 19 percent over 1949. The leading producers were: The American Zinc Co. of Tennessee, operating the Athletic, Grasselli, Jarnagin, and the Mascot No. 2 mines; the Universal Exploration Co.; and the Tennessee Copper Co. Production of zinc in 1950 in Virginia declined 6 percent compared with 1949, chiefly due to a labor strike from October 9 to November 23 at the Austinville mine of the New Jersey Zinc Co. The Wisconsin and Northern Illinois region reported a 50-percent increase in zinc output in 1950, most of which can be attributed to new operations of Calumet & Hecla Consolidated Copper Co. near Shullsburg, Wis., and the Eagle-Picher Mining & Smelting Co. near Galena, Ill. Other producers in the area include the Dodgeville Mining Co., Dodgeville, Wis. (operations resumed in July); the Vinegar Hill Zinc Co. near Shullsburg; and the Tri-State Zinc, Inc., in Illinois.

The 25 leading zinc-producing mines in the United States in 1950, listed in table 4, yielded 61 percent of the total domestic zinc output; the 3 leading mines produced over 21 percent and the 6 leading mines nearly 32 percent.

Detailed information on the production of mines and mining districts in the United States may be found in the chapters of this volume dealing with the mine production of gold, silver, copper, lead, and zinc in the various States.

Table 4.—Twenty-five leading zinc-producing mines in the United States in 1950, in order of output

Rank	Mine	District	State	Operator	Type of ore
1	Franklin & Sterling Hill	New Jersey	New Jersey	New Jersey Zinc Co	Zinc.
2	Butte Hill mines & dumps	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Zinc-lead.
3	Balmat	St. Lawrence County	New York	St. Joseph Lead Co	Do.
4	Star	Hunter	Idaho	Sullivan Mining Co	Do.
5	Copper Queen	Warren (Bisbee)	Arizona	Phelps Dodge Corp	Do.
6	Eagle Mine Group	Red Cliff	Colorado	Empire Zinc Division, New Jersey Zinc Co	Zinc.
7	United States & Lark	West Mountain (Bingham)	Utah	U. S. Smelting, Refining & Mining Co	Zinc-lead.
8	Pioche Group	Pioche (Highland)	Nevada	Combined Metals Reduction Co	Do.
9	Mascot No. 2	Eastern Tennessee	Tennessee	American Zinc Co. of Tennessee	Zinc.
10	Austinville	Austinville	Virginia	New Jersey Zinc Co	Zinc-lead.
11	Edwards	St. Lawrence County	New York	St. Joseph Lead Co	Zinc.
12	Iron King	Big Bug	Arizona	Shattuck Denn Mining Corp	Zinc-lead.
13	Page Group	Yreka	Idaho	Federal Mining & Smelting Co	Do.
14	Davis-Bible Group	Eastern Tennessee	Tennessee	Universal Exploration Co	Zinc.
15	Emma	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co	Zinc-lead.
16	Graham	Northern Illinois	Illinois	Eagle Picher Mining & Smelting Co	Zinc.
17	Morning	Hunter	Idaho	Federal Mining & Smelting Co	Zinc-lead.
18	Bautsch	Northern Illinois	Illinois	Tri-State Zinc Inc	Do.
19	United Verde	Verde (Jerome)	Arizona	Phelps Dodge Corp	Zinc-copper.
20	Bunker Hill & Sullivan	Yreka	Idaho	Bunker Hill & Sullivan Mining & Concentrating Co.	Zinc-lead.
21	Kearney	Central	New Mexico	Peru Mining Co	Zinc.
22	Sidney Group	Yreka	Idaho	Sidney Mining Co	Zinc-lead.
23	Rialto	Tri-State	Oklahoma	Nellie B. Mining Co	Do.
24	Grasselli	Eastern Tennessee	Tennessee	American Zinc Co. of Tennessee	Do.
25	Grandview	Metaline	Washington	American Zinc Lead Smelting Co	Do.

TABLE 5.—Mine production of recoverable zinc in the United States by districts that produced 1,000 tons or more during any year, 1941–45 (average) and 1946–50, in short tons

District	State	1941–45 (average)	1946	1947	1948	1949	1950
Coeur d'Alene region	Idaho	77,905	67,429	79,251	83,801	74,370	86,103
Tri-State (Joplin region)	Kansas, Southwestern Missouri, Oklahoma	205,366	139,038	109,338	84,839	78,628	80,558
Summit Valley (Butte)	Montana	18,300	7,108	40,712	52,625	47,982	63,511
New Jersey	New Jersey	88,473	64,454	76,871	76,332	50,984	55,029
St. Lawrence County	New York	38,154	32,515	34,116	34,566	37,973	38,321
Eastern Tennessee [1]	Tennessee	39,312	24,614	31,212	29,524	29,788	35,326
Central	New Mexico	42,026	32,279	38,155	35,140	26,376	26,897
Upper Mississippi Valley	Northern Illinois, Iowa,[2] Wisconsin	14,236	18,344	17,077	14,061	17,846	26,793
Warren (Bisbee)	Arizona	6,142	22,374	32,546	27,669	35,393	20,707
Red Cliff	Colorado	19,782	16,437	17,375	16,355	17,450	19,956
Pioche	Nevada	13,979	15,764	14,362	18,612	18,651	19,655
West Mountain (Bingham)	Utah	20,071	7,593	20,446	22,077	22,311	16,120
Austinville	Virginia	18,020	16,905	16,788	15,882	13,166	[1] 12,396
Metaline	Washington	10,829	7,685	9,754	5,985	6,496	11,032
Big Bug	Arizona	3,236	5,234	4,991	5,832	8,798	10,416
Upper San Miguel	Colorado	778	1,963	2,067	3,486	6,004	8,881
Verde (Jerome)	Arizona	—	—	—	459	4,350	7,800
Park City region	Utah	11,536	8,876	10,956	10,320	8,359	7,425
California (Leadville)	Colorado	4,861	5,996	4,809	5,726	6,455	7,392
Kentucky-Southern Illinois	Kentucky, Southern Illinois	6,456	5,044	5,728	7,422	6,541	6,642
Tintic	Utah	2,243	3,710	3,969	3,680	6,082	5,985
Pima (Sierritas, Papago, Twin Buttes)	Arizona	2,051	3,948	4,727	5,758	7,177	5,802
Coso	California	364	854	603	4,497	4,062	5,237
Old Hat (Oracle)	Arizona	2,060	4,235	3,427	3,796	5,195	4,603
Harshaw	do	3,094	1,128	2,006	2,875	2,947	4,193
Ten Mile	Colorado	1,062	2,490	4,587	10,338	9,716	2,925
Pioneer (Superior)	Arizona	3,648	—	—	—	—	2,595
Chelan Lake	Washington	1,085	1,730	1,000	3,289	[3] 2,724	[3] 2,430
Smelter (Lewis and Clark County)	Montana	17,193	4,995	748	3,417	1,463	2,358
Magdalena	New Mexico	3,715	3,474	5,013	4,856	2,263	1,677
Eureka (Bagdad)	Arizona	275	325	257	2,321	2,304	1,478
Pioneer (Rico)	Colorado	3,580	3,435	3,433	3,180	1,354	1,365
Northport	Washington	910	1,790	2,788	3,271	1,412	1,304
Warm Springs	Idaho	5,266	2,161	2,791	1,545	1,635	1,236
Rush Valley and Smelter (Tooele County)	Utah	6,835	6,365	5,642	3,552	2,188	1,219
Cochise	Arizona	326	2,877	3,143	2,875	1,760	1,025
Tomichi	Colorado	255	440	1,684	1,983	1,456	963
Animas	do	611	1,590	1,310	748	1,029	961
Aravaipa	Arizona	135	152	20	1,098	783	921

Heddleston	Montana	1,235	1,516	1,482	1,437	2,026	892
Sneffels	Colorado	297	(4)	(4)	815	1,053	810
Breckenridge	do	258	1,110	1,279	171	362	427
Ophir	Utah	124	294	987	786	1,004	374
Campo Seco	California	569	3,301	2,350	----------	363	326
Eureka (Lone Mountain)	Nevada	289	3,705	897	19	108	321
Pinos Altos	New Mexico	412	81	724	1,056	243	144
Cow Creek [5]	California	36	----------	----------	(4)	(4)	(4)
Flat Creek	do	695	1,926	1,707	----------	----------	----------
Smelter (Cascade County)	Montana	----------	----------	----------	----------	1,278	----------

[1] Includes very small quantity produced elsewhere in State.
[2] No production in Iowa since 1917.
[3] Includes Peshastin Creek and Wenatchee River districts.
[4] Quantity withheld to avoid disclosure of individual company operations.
[5] This district is not listed in order of 1950 output.

SMELTER PRODUCTION

During 1950, 18 primary zinc-reduction plants were in operation; 9 operated with horizontal retorts exclusively, 4 with vertical retorts exclusively (1 electrothermic), and 5 with electrolytic methods.

Horizontal-Retort Plants.—The total number of retorts reported at horizontal-retort primary plants in 1950 was 54,624, a 2-percent reduction from the 55,584 retorts on December 31, 1949, at plants that operated during that year. Of the total retorts reported, 52,484 (96 percent) were in use at the close of 1950 compared with 51,652 (93 percent) in operation at the end of 1949.

Vertical-Retort Plants.—Four vertical retort continuous distilling plants operated during 1950. The total number of vertical retorts increased from 79 on December 31, 1949, to 88 at the end of 1950. At the close of the year 82 vertical retorts were in operation.

Electrolytic Plants.—Five electrolytic zinc reduction plants were in operation during 1950. There was a total of 3,360 cells at the plants on December 31, 1950, of which 3,322 (99 percent) were in operation. The number of cells at the end of 1949 was 3,370, of which 3,235 (96 percent) were operating.

Smelting Capacity.—Irrespective of additions or subtractions of smelter recovery units, statistics on domestic smelting capacity vary from year to year, owing to changes in metallurgical practices among the various plants. According to reports to the Bureau of Mines, the zinc-reduction plants in the United States on December 31, 1950, had a stated annual capacity of 1,044,000 tons of slab zinc under normal operating conditions, allowing for necessary shut-downs for repairs. This figure, which compares with a 1,035,000-ton reported capacity at the end of 1949, indicates that 1950 output was 87 percent of capacity. Horizontal- and vertical-retort plants operated at 86 percent of a stated 619,000-ton capacity (82 percent of a 621,000-ton capacity in 1949), electrolytic plants at 93 percent of a 369,000-ton capacity (90 percent of 362,500-ton capacity in 1949), and secondary smelters at 69 percent of a 56,000-ton capacity (62 percent of a 52,000-ton capacity in 1949).

Waelz Kilns.—The following companies operated Waelz kilns in 1950:

Arkansas: Fort Smith—The Residue Co.
Illinois:
- Danville—The Hegeler Zinc Co.
- Fairmont City—American Zinc Co. of Illinois.
- La Salle—Matthiessen & Hegeler Zinc Co.

Kansas: Cherryvale—National Zinc Co., Inc.
Oklahoma: Henryetta—Eagle-Picher Mining & Smelting Co.
Pennsylvania:
- Donora—American Steel & Wire Co.
- Palmerton—New Jersey Zinc Co.

Slag-Fuming Plants.—The following companies operated slag-fuming plants in 1950 and produced impure zinc oxide, which was further treated to recover slab zinc:

Idaho: Bradley—Bunker Hill & Sullivan Mining & Concentrating Co.
Montana: East Helena—Anaconda Copper Mining Co.
Texas: El Paso—American Smelting & Refining Co.
Utah: Tooele—International Smelting & Refining Co.

During 1950 these four plants treated 652,172 tons of hot and cold slag, which yielded 102,826 tons of oxide fume containing 63,522 tons of recoverable zinc. Corresponding figures for the four operating plants in 1949 were 613,615, 98,263, and 65,854 tons, respectively.

Active Zinc-Reduction Plants.—Modernization and expansion of existing zinc smelters and the adoption of new metallurgical techniques were important features of the zinc industry in 1950. The last of the old horizontal retorts with which the New Jersey Zinc Co., Palmerton, Pa., smelter was originally equipped was removed in 1950. At the end of September the company put into operation 9 new vertical retorts, bringing the total to 43. Installation of the new retorts, which are equipped with splash condensers, is reported to have resulted in improved zinc recovery and higher productivity per retort.

Tests to establish the advantage of mechanical overhand charging at horizontal retort smelters continued at the American Smelting & Refining Co. plant in Amarillo, Tex. A mechanical charging machine was used during the year on all but two blocks of horizontal retorts. As a result of tests on sintering raw concentrates at its Blackwell, Okla., smelter, the American Metal Co. began to construct a sintering plant with one large machine 168 feet long and 12 feet wide. This machine, the largest ever constructed, will have a capacity of 600 tons of raw concentrate per day and is expected to exhibit a lower operating cost, greater elimination of cadmium, and a more uniform and desirable sinter than have heretofore been achieved on the standard-size sintering machines.

A list of zinc-reduction plants operating in the United States in 1950 follows:

Primary zinc distillers

Horizontal-retort plants

Arkansas: Fort Smith—Athletic Mining & Smelting Co.
Illinois:
    Fairmont City—American Zinc Co. of Illinois.
    La Salle—Matthiessen & Hegeler Zinc Co.
Oklahoma:
    Bartlesville—National Zinc Co., Inc.
    Blackwell—Blackwell Zinc Co.
    Henryetta—Eagle-Picher Mining & Smelting Co.
Pennsylvania: Donora—American Steel & Wire Co.
Texas:
    Amarillo—American Smelting & Refining Co.
    Dumas—American Zinc Co. of Illinois.

Vertical-retort plants

Illinois: Depue—The New Jersey Zinc Co.
Pennsylvania:
    Josephtown—St. Joseph Lead Co.
    Palmerton—The New Jersey Zinc Co. of Pennsylvania.
West Virginia: Meadowbrook—E. I. du Pont de Nemours & Co., Inc.

Electrolytic plants

Idaho: Kellogg—Sullivan Mining Co.
Illinois: Monsanto—American Zinc Co. of Illinois.
Montana:
    Anaconda—Anaconda Copper Mining Co.
    Great Falls—Anaconda Copper Mining Co.
Texas: Corpus Christi—American Smelting & Refining Co.

Secondary zinc distillers

Alabama: Fairfield—W. J. Bullock, Inc.
California:
 Los Angeles—American Smelting & Refining Co., Federated Metals Division.
 Torrance—Pacific Smelting Co.
Illinois:
 Beckemeyer—American Smelting & Refining Co., Federated Metals Division.
 Hillsboro—American Zinc, Lead & Smelting Co.
 Sandoval—Sandoval Zinc Co.
New Jersey: Trenton—American Smelting & Refining Co., Federated Metals Division.
New York: Tottenville—Nassau Smelting & Refining Co.
Oklahoma: Sand Springs—American Smelting & Refining Co., Federated Metals Division.
Pennsylvania:
 Bristol—Superior Zinc Corp.
 Philadelphia—General Smelting Co.
West Virginia: Wheeling—Wheeling Steel Corp.

SLAB ZINC

The output of primary slab zinc in 1950 advanced 4 percent over 1949 production. Output from domestic concentrates fell 1 percent. Production from foreign concentrates, however, rose 14 percent.

Production of redistilled slab zinc rose 22 percent from 1949 and was the highest on record. Of the 66,970 tons of redistilled secondary slab zinc produced in 1950, 28,411 tons (42 percent) were derived from primary smelters, and 38,559 tons (58 percent) were produced at secondary plants.

Data on output of remelted secondary slab zinc are not included with those for redistilled metal. In 1950 the production of slab zinc recovered by remelting purchased scrap was 7,243 tons (6,045 tons in 1949). Zinc rolling mills and other substantial consumers of slab zinc recovered large quantities of zinc from their own plant scrap; but such metal is not measured statistically, for it seldom enters the market as scrap.

In addition to redistilled and remelted unalloyed secondary zinc, a large quantity of secondary zinc is recovered each year in the form of alloys, zinc dust, zinc pigments, and zinc salts. Additional information on secondary zinc is given in the Secondary Metals—Nonferrous chapter of this volume.

TABLE 6.—Primary and redistilled secondary slab zinc produced in the United States, 1941–45 (average) and 1946–50, in short tons

Year	Primary			Redistilled secondary	Total (excludes zinc recovered by remelting)
	From domestic ores	From foreign ores	Total		
1941–45 (average)	583,669	[1] 274,344	858,013	51,838	909,851
1946	459,205	269,057	728,262	44,516	772,778
1947	510,058	292,437	802,495	59,542	862,037
1948	537,966	249,798	787,764	62,320	850,084
1949	591,454	223,328	814,782	55,041	869,823
1950	588,291	[1] 255,176	843,467	66,970	910,437

[1] Includes a small tonnage of foreign slab zinc further refined into high-grade metal in the United States.

Labor strikes continued in 1950 to hamper smelter output of slab zinc, but not to the extent of 1948 and 1949. The strike at the vertical retort smelter at Palmerton, Pa., which started on September 26, 1949, was not settled until January 26, 1950. The horizontal-retort smelter at Henryetta, Okla., was strike-bound from July 31 through October 7. The coal shortage during the early months of the year resulted in a reduction in availability of electric power which curtailed production at the Josephtown, Pa., smelter in late February and early March.

Of the 1950 output of primary zinc, 59 percent was distilled and 41 percent produced electrolytically.

Production of Special High Grade, Selected, and Prime Western rose 18, 57, and 6 percent, respectively, in 1950. Output of Regular High Grade and Brass Special declined 7 and 17 percent, respectively. Production of Intermediate Grade and unchanged. Of the total 1950 output (comparable 1949 figures in parentheses) 41 percent (40 percent) was Prime Western, 30 percent (27 percent) Special High Grade, 21 percent (24 percent) Regular High Grade, 5 percent (6 percent) Brass Special, 2 percent (3 percent) Intermediate, and less than one-half of 1 percent Selected.

TABLE 7.—Distilled and electrolytic zinc, primary and secondary, produced in the United States, 1941–45 (average) and 1946–50, in short tons

CLASSIFIED ACCORDING TO METHOD OF REDUCTION

Year	Electrolytic primary	Distilled	Redistilled secondary [1]		Total
			At primary smelters	At secondary smelters	
1941–45 (average)	278,903	579,110	23,829	28,009	909,851
1946	281,295	446,967	18,408	26,108	772,778
1947	295,520	506,975	22,093	37,449	862,037
1948	312,477	475,287	28,070	34,250	850,084
1949	326,152	488,630	22,782	32,259	869,823
1950	342,085	501,382	28,411	38,559	910,437

CLASSIFIED ACCORDING TO GRADE

Year	Grade A		Grade B (Intermediate)	Grades C and D		Grade E (Prime Western)	Total
	Special High Grade (99.99% Zn)	Regular High Grade (Ordinary)		Brass Special	Selected		
1941–45 (average)	239,814	234,986	64,012	74,472	18,832	277,735	909,851
1946	236,184	180,366	32,294	75,296	13,697	234,941	772,778
1947	239,274	190,429	36,812	61,104	12,844	321,574	862,037
1948	248,346	196,482	38,892	45,946	4,723	315,695	850,084
1949	230,576	206,651	21,513	56,388	2,565	352,130	869,823
1950	271,678	192,075	21,571	46,730	4,021	374,362	910,437

[1] For total production of secondary zinc see chapter on Secondary Metals—Nonferrous.

Montana continued to be the leading producer of primary slab zinc in 1950; Pennsylvania and Oklahoma were in second and third places, respectively. Of the States for which production statistics may be shown separately, Illinois, Idaho, and Arkansas occupied the next three positions. As usual, in Montana and Idaho slab zinc was produced by electrolytic methods only. In Illinois and Texas both electrolytic and distilled zinc metal were recovered, whereas in all other States zinc was recovered by distillation alone.

TABLE 8.—Primary slab zinc produced in the United States, by States where smelted, 1941–45 (average) and 1946–50, in short tons

Year	Arkansas	Idaho	Illinois	Montana	Oklahoma	Pennsylvania	Texas and West Virginia [1]	Total	
								Short tons	Value
1941–45 (average)	36,428	38,000	159,864	202,224	98,766	215,786	106,945	858,013	$144,317,898
1946	18,720	34,832	104,002	186,662	104,125	178,811	101,110	728,262	129,630,636
1947	17,158	41,801	113,192	197,453	128,398	193,524	110,969	802,495	171,894,429
1948	15,586	42,064	93,229	207,717	137,844	171,276	120,048	787,764	209,860,330
1949	[2] 17,116	41,854	86,823	216,578	157,650	156,920	137,841	814,782	202,391,849
1950	20,688	53,922	108,301	216,104	145,117	162,539	136,796	843,467	240,050,708

[1] Includes Missouri, 1943–44 and 1947–50.
[2] Corrected figure.

BYPRODUCT SULFURIC ACID

Sulfuric acid made from sulfur dioxide gases produced in roasting zinc blende (sphalerite) is an important byproduct of zinc smelting. To utilize a larger proportion of their acid-producing capacity, some plants also consumed large quantities of native sulfur. Combined production of sulfuric acid from both sources (*see* table 9) increased 40 percent in 1950.

TABLE 9.—Sulfuric acid (basis, 100 percent) made at zinc-blende roasting plants in the United States, 1946–50

Year	Made from zinc-blende [1]		Made from native sulfur		Total [1]		
						Value [2]	
	Short tons	Value [2]	Short tons	Value [2]	Short tons	Total	Average per ton
1946	544,529	$6,842,541	160,886	$2,021,696	705,415	$8,864,237	$9.76
1947	598,703	8,001,205	266,104	3,556,281	864,807	11,557,486	10.38
1948	529,478	7,478,271	233,099	3,292,261	762,577	10,770,532	10.97
1949	476,932	7,276,481	130,592	1,992,423	607,524	9,268,904	11.85
1950	609,571	8,829,236	243,743	3,530,464	853,314	12,359,700	11.25

[1] Includes acid from foreign blende.
[2] At average of sales of 60° B. acid.

ZINC DUST

Production of zinc dust in 1950 totaled 28,922 tons, a 27-percent increase over 1949 output. Zinc powder and blue powder are not included in the Bureau of Mines production totals; the zinc dust statistically reported is restricted to commercial grades that comply with close specifications as to percentage of unoxidized metal, evenness of grading, and fineness of particles. The zinc content of the dust produced in 1950 ranged from 92.86 to 99.72 percent and averaged 97.87 percent. Shipments of zinc dust, which totaled 26,518 tons—441 tons of which went to foreign countries—were slightly lower than production. The quantity consumed at manufacturers' plants (9 percent of output) was greater than the difference between production and shipments, with the result that producers' stocks decreased from 1,310 tons at the beginning to 571 tons at the end of the year.

The average price of zinc dust shipped to domestic consumers in 1950 was 16.6 cents a pound compared with 13.56 cents in 1949. The raw materials used to manufacture zinc dust are reviewed in the Secondary Metals—Nonferrous chapter of this volume. Most of the production is from zinc scrap (principally galvanizers' dross), but some is recovered from zinc ore, slab zinc, and as a byproduct of zinc refining.

TABLE 10.—Zinc dust [1] produced in the United States, 1941–45 (average) and 1946–50

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per pound			Total	Average per pound
1941–45 (average)	25,122	$5,063,202	$0.101	1948	32,217	$10,051,704	$0.156
1946	28,574	6,057,688	.106	1949	22,776	[2] 6,195,072	.136
1947	30,602	7,589,296	.124	1950	28,922	9,602,104	.166

[1] All produced by distillation.
[2] Revised figure.

ZINC PIGMENTS AND SALTS

The principal zinc pigments are zinc oxide and lithopone, and the principal salts are the chloride and sulfate. These products are manufactured from various zinc-bearing materials, including ore, metal, scrap, and residues. Details of the production of zinc pigments and salts are given in the Lead and Zinc Pigments and Zinc Salts chapter of this volume.

CONSUMPTION AND USES

According to reports from 588 plants, 967,134 tons of slab zinc were put into process in 1950, a 36-percent increase over the 1949 level and the largest quantity on record. Receipts at consumers' plants in 1950 were 946,091 tons. Comparison of the calculated figure of slab zinc available to consumers and the actual measured consumption since 1943 indicates that coverage of the consumer survey was approximately 96 percent.

Galvanizing continued to be the largest field of zinc use in 1950; the quantity so consumed during the year was 19 percent above the previous annual record established in 1948. Zinc-base alloys, largely die castings, continued to be the second-largest application of slab zinc, establishing a new high 23 percent over the 1948 record. Consumption of slab zinc for the manufacture of brass products rose 63 percent over 1949 to the highest point since 1946, but was well below the average of the immediate pre-World War II period. The low level of slab zinc consumption in brass in the postwar period is attributable to the abnormal flow of brass scrap to the mills.

TABLE 11.—Consumption of slab zinc in the United States, 1946–50, by industries, in short tons [1]

Industry and product	1946	1947	1948	1949	1950
Galvanizing: [2]					
Sheet and strip	113,816	115,147	120,360	146,923	188,406
Wire and wire rope	43,667	49,726	49,906	39,231	47,317
Tubes and pipe	62,460	77,238	81,874	78,030	91,877
Fittings	10,593	10,467	14,037	11,487	15,948
Other	89,223	108,749	104,792	75,209	98,138
Total galvanizing	319,759	361,327	370,969	350,880	441,686
Brass products:					
Sheet, strip, and plate	66,125	50,212	51,813	43,157	68,737
Rod and wire	53,387	34,653	32,076	23,651	43,413
Tube	19,173	15,488	15,890	12,816	17,385
Castings and billets	4,776	3,155	4,228	2,620	4,170
Copper-base ingots	4,379	7,299	3,546	2,701	4,081
Other copper-base products	1,262	1,540	1,587	589	1,587
Total brass products	149,102	112,347	109,140	85,534	139,373
Zinc-base alloy:					
Die castings	206,237	210,214	230,995	199,665	285,022
Alloy dies and rod	5,313	3,802	3,171	2,024	2,929
Slush and sand castings	661	453	462	492	1,576
Total zinc-base alloy	212,211	214,469	234,628	202,181	289,527
Rolled zinc	92,397	70,680	76,672	55,200	68,444
Zinc oxide	19,170	18,376	15,657	10,292	18,187
Other uses:					
Wet batteries	1,635	1,462	1,368	1,359	1,527
Desilverizing lead	1,781	2,687	2,654	2,448	2,947
Light-metal alloys	545	607	1,125	1,060	1,356
Other [3]	4,642	4,405	5,522	2,887	4,087
Total other uses	8,603	9,161	10,669	7,754	9,917
Total consumption [4]	801,242	786,360	817,735	711,841	967,134

[1] Excludes some small consumers.
[2] Includes zinc used in electrogalvanizing and electroplating, but excludes sherardizing.
[3] Includes zinc used in making zinc dust, bronze powder, alloys, chemicals, castings, and miscellaneous uses not elsewhere mentioned.
[4] Includes 3,912 tons of remelt zinc in 1946, 3,577 tons in 1947, 3,141 tons in 1948, 2,394 tons in 1949, and 3,035 tons in 1950.

The quantity of slab zinc consumed for rolled products in 1950 increased 24 percent from the 1949 figure. In addition to slab zinc, the rolling mills remelt and reroll the metallic scrap produced from their fabricating operations. The scrap so treated in 1950 amounted to 13,841 tons, an increase of 54 percent above the 8,977 tons processed in 1949. Purchased zinc scrap, in the form of zinc clippings, old zinc scrap, and engravers' plates, totaling 4,516 tons was melted and rolled in 1950 (3,802 tons in 1949). Production of rolled zinc from both slab zinc and purchased scrap was 70,075 tons, an increase of 21 percent over the 1949 total. Inventories of rolled zinc were 1,420 tons on December 31, 1950, compared with 2,076 tons (revised figure) on the same date in 1949. In addition to the actual shipments of 56,253 tons of rolled zinc in 1950, the rolling mills processed 28,127 tons of rolled zinc (including that which was remelted and rerolled) in manufacturing 14,568 tons of semifabricated and finished products.

TABLE 12.—Rolled zinc produced and quantity available for consumption in the United States, 1949–50

	1949			1950		
	Short tons	Value		Short tons	Value	
		Total	Average per pound		Total	Average per pound
Production:						
Sheet zinc not over 0.1 inch thick	14,710	$5,642,609	$0.192	18,436	$8,805,695	$0.239
Boiler plate and sheets over 0.1 inch thick	757	257,855	.170	926	377,778	.204
Strip and ribbon zinc [1]	41,354	13,691,412	.166	49,167	18,335,444	.186
Foil, rod, and wire	1,166	552,546	.237	1,546	849,581	.275
Total rolled zinc	57,987	20,144,422	.174	70,075	28,368,498	.202
Imports	32	8,144	.127	211	92,862	.220
Exports	6,147	2,858,566	.232	3,290	1,496,158	.227
Available for consumption	[2] 53,919			67,652		
Value of slab zinc (all grades)			.124			.142
Value added by rolling			.050			.060

[1] Figures represent net production. In addition 8,977 tons of strip and ribbon zinc in 1949 and 13,841 tons in 1950 were rerolled from scrap originating in fabricating plants operated in connection with zinc rolling mills.
[2] Revised figure.

Table 13 shows the six commercial grades of refined slab zinc and purchased remelt spelter consumed by the various industries in 1950. Of the 967,134 tons of domestic and foreign zinc consumed, 44 percent was Prime Western, 34 percent Special High Grade, and 14 percent Regular High Grade, compared with 45, 33, and 14 percent, respectively, in 1949. All grades of zinc were used for galvanizing. Prime Western was the principal grade used in the hot-dip process, the higher grades being used chiefly for electrogalvanizing. Rigid specifications in brass manufacture necessitate the use of high-purity metal, 76 percent of the total used in this industry being of the two highest grades.

TABLE 13.—Consumption of slab zinc in the United States in 1950, by grade and industry, in short tons [1]

Industry	Special High Grade	Regular High Grade	Intermediate	Brass Special	Selected	Prime Western	Remelt	Total
Galvanizers	14,892	17,549	9,842	8,475	104	388,506	2,318	441,686
Brass products	24,040	81,667	2,369	10,754	2,813	17,096	634	139,373
Zinc-base alloy	278,824	10,375	65			247	16	289,527
Rolled zinc	7,087	21,588	19,583	16,059	50	4,077		68,444
Zinc oxide	1,632	2,987		650		12,918		18,187
Other	1,549	2,108	1,243	212		4,738	67	9,917
Total	328,024	136,274	33,102	36,150	2,967	427,582	3,035	967,134

[1] Excludes some small consumers. For other qualifications, see footnotes to table 11.

CONSUMPTION OF SLAB ZINC BY GEOGRAPHIC AREAS [2]

The geography of slab zinc consumption is available in detail only since 1940. During the 11-year period through 1950, substantial

[2] This section is based partly on a detailed study by Ransome, Alfred L., Consumption of Slab Zinc in the United States by Industries, Grades, and Geographic Divisions, 1940–45: Bureau of Mines Inf. Circ. 7450, 1948, 30 pp.

shifts are observable, largely the result of conversion to war production in 1940–41 and reconversion to peacetime consumption in 1945–46. The distribution of slab zinc consumption by geographic divisions and States, both total and for individual uses, is shown in tables 14–20.

Consumption of Slab Zinc for All Uses.—During the period 1940–50 Illinois ranked first among the 42 zinc-consuming States and the District of Columbia, with an annual average of 136,978 short tons. Since 1945 Ohio has been in second place. Connecticut, which averaged second during the war period owing to the large quantities of zinc consumed in the brass plants of that State, has since dropped to fourth place. Since 1940 Pennsylvania has held either second or third place. The greatest concentration of slab-zinc consumption is in the region comprising Illinois, Indiana, Michigan, Ohio, and Wisconsin. This area, which has consistently ranked first in zinc consumption since 1940, uses nearly half the total quantity of slab zinc consumed annually in the United States. The region of least consumption is the Mountain States, including Arizona, Colorado, Idaho, Nevada, New Mexico, and Utah, which have accounted for less than 0.3 percent of the total.

TABLE 14.—Consumption of slab zinc in the United States, 1943–47 (average) and 1948–50, by geographic divisions and States [1]

Geographic division and State	1943–47 (average)		1948		1949		1950	
	Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
I. New England:								
Connecticut	104,552	4	57,001	5	40,948	5	70,115	4
Massachusetts	13,907	14	10,476	15	7,454	16	9,507	16
Maine	724	25	78	31	67	31	97	31
New Hampshire	245	30	(2)	35	(2)	34	(2)	36
Rhode Island	174	32	(2)	29	(2)	30	(2)	28
Total	119,602	3	67,891	3	48,650	4	80,014	3
II. Middle Atlantic:								
New Jersey	22,664	11	20,944	12	19,084	12	23,231	12
New York	44,836	6	47,262	6	39,619	6	55,070	7
Pennsylvania	117,295	3	130,912	3	105,308	3	139,400	3
Total	184,795	2	199,118	2	164,011	2	217,701	2
III. South Atlantic:								
District of Columbia	125	35	(2)	33	21	32	(2)	34
Florida	144	33	---	---	---	---	---	---
Georgia	1,667	20	2,738	19	1,703	20	2,164	21
Maryland	24,724	9	24,966	9	26,525	9	36,649	10
South Carolina	139	34	(2)	32	---	---	(2)	32
Virginia	591	27	(2)	28	267	27	207	30
West Virginia	21,164	12	23,781	10	25,694	11	29,736	11
Total	48,554	4	51,939	4	54,210	3	68,825	4
IV. East North Central:								
Illinois	137,272	1	152,050	1	131,619	1	183,957	1
Indiana	64,658	5	61,356	4	52,837	4	67,449	5
Michigan	44,328	7	41,887	7	32,265	7	57,017	6
Ohio	119,337	2	132,044	2	123,903	2	152,008	2
Wisconsin	27,594	8	11,988	14	9,152	15	13,752	14
Total	393,189	1	399,325	1	349,776	1	474,183	1

For footnotes, see end of table.

TABLE 14.—Consumption of slab zinc in the United States, 1943–47 (average) and 1948–50, by geographic divisions and States [1]—Continued

Geographic division and State	1943–47 (average)		1948		1949		1950	
	Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
V. East South Central:								
Alabama	16,708	13	22,030	11	26,383	10	37,061	9
Kentucky	6,350	16	9,014	16	9,781	14	(2)	15
Tennessee	1,013	24	1,242	23	860	25	(2)	23
Total	24,071	6	32,286	5	37,024	5	48,808	5
VI. West North Central:								
Iowa	6,331	17	7,409	17	4,600	17	4,680	17
Kansas	91	36	22	34	19	33	(2)	33
Minnesota	2,701	18	4,062	18	2,970	18	4,250	18
Missouri	13,578	15	17,569	13	13,166	13	16,500	13
Nebraska	1,116	23	1,551	22	1,587	21	(2)	22
Total	23,817	7	30,613	6	22,342	7	27,122	7
VII. West South Central:								
Louisiana	292	29	(2)	30	(2)	29	722	26
Oklahoma	638	26	(2)	24	(2)	24	1,261	24
Texas	2,334	19	1,726	21	1,836	19	3,289	19
Total	3,264	8	2,900	8	3,014	8	5,272	8
VIII. Mountain:								
Arizona	19	39	------	------	------	------	------	------
Colorado	1,429	21	1,824	20	(2)	22	2,474	20
Idaho	197	31	(2)	26	(2)	26	(2)	27
Nevada	54	37	------	------	------	------	------	------
Utah	38	38	(2)	36	(2)	35	(2)	35
Total	1,737	9	2,312	9	1,851	9	3,160	9
IX. Pacific:								
California	24,247	10	26,946	8	27,305	8	37,525	8
Oregon	565	28	361	27	245	28	244	29
Washington	1,306	22	903	25	1,019	23	1,245	25
Total	26,118	5	28,210	7	28,569	6	39,014	6
Grand total [1]	825,147	------	814,594	------	709,447	------	964,099	------

[1] Excludes remelt zinc and some small consumers of slab zinc.
[2] Nominal quantity consumed included with subtotal for division, as less than 3 companies reported.

Consumption of Slab Zinc for Galvanizing.—The iron and steel industry is the largest consumer of slab zinc, which it uses for galvanizing or rustproofing sheets, wire, tube and pipes, building and pole-line hardware, railway-signal equipment, chains, bolts, screws, and a multitude of other items. The principal iron- and steel-producing States are thus also the principal consumers of zinc for galvanizing. From 1940 through 1943, Pennsylvania ranked first among the 34 States that consumed zinc for this purpose. In 1944 Ohio displaced Pennsylvania and retained the top position in the succeeding years through 1950. The greatest concentration of zinc consumption for galvanizing is the region comprising Illinois, Indiana, Ohio, and Pennsylvania, which accounted for 62 percent of the average annual domestic consumption for this use in the period 1940–45. In 1946 total zinc used for galvanizing in these States rose to 65 percent but declined to 63 percent in 1947 and 1948, 61 percent in 1949, and 59 percent in 1950.

TABLE 15.—Consumption of slab zinc for galvanizing in the United States, 1943–47 (average) and 1948–50, by States [1]

State	Geographic division	1943–47 (average)		1948		1949		1950	
		Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
Alabama	V	16,640	7	(2)	7	25,918	5	36,520	4
California	IX	13,534	8	15,046	8	13,493	8	21,208	8
Colorado	VIII	1,381	20	(2)	19	(2)	20	(2)	19
Connecticut	I	3,594	15	3,752	15	1,843	16	3,003	17
Florida	III	142	31						
Georgia	III	1,662	18	(2)	17	(2)	18	(2)	20
Illinois	IV	33,757	3	47,660	3	43,430	3	55,276	3
Indiana	IV	22,544	4	26,458	4	25,113	6	35,375	6
Iowa	VI	153	30	(2)	31	(2)	30	89	30
Kentucky	V	6,320	11	(2)	9	(2)	9	(2)	9
Louisiana	VII	283	27	(2)	28	(2)	26	722	24
Maine	I	682	23	(2)	29	(2)	29	(2)	29
Maryland	III	17,688	6	24,422	5	26,196	4	36,136	5
Massachusetts	I	6,889	9	6,065	10	4,188	12	5,460	11
Michigan	IV	4,396	13	3,513	16	2,598	15	4,446	13
Minnesota	VI	2,697	16	4,062	14	(2)	14	4,250	14
Missouri	VI	3,710	14	4,483	13	3,472	13	4,087	15
Nebraska	VI	202	28	(2)	27	(2)	27	(2)	27
New Hampshire	I	73	33						
New Jersey	II	6,414	10	5,104	12	4,608	10	4,546	12
New York	II	5,629	12	5,906	11	4,382	11	6,031	10
Ohio	IV	71,815	1	82,622	1	78,663	1	88,629	1
Oklahoma	VII	623	24	(2)	21	(2)	21	1,261	21
Oregon	IX	555	25	(2)	24	(2)	25	229	26
Pennsylvania	II	67,344	2	73,806	2	67,230	2	79,344	2
Rhode Island	I	162	29	(2)	25	(2)	28	(2)	25
South Carolina	III	117	32	(2)	30			(2)	31
Tennessee	V	811	22	(2)	22	(2)	23	(2)	22
Texas	VII	1,384	19	(2)	20	(2)	19	3,251	16
Utah	VIII	33	34			(2)	24		
Virginia	III	461	26	(2)	26			185	28
Washington	IX	1,126	21	(2)	23	(2)	22	1,041	23
West Virginia	III	19,513	5	(2)	6	(2)	7	29,187	7
Wisconsin	IV	2,613	17	2,560	18	1,806	17	2,505	18
Total [1]		314,947		[3] 368,796		[3] 348,983		[3] 439,368	

[1] Excludes remelt zinc. Includes zinc used in electrogalvanizing and electroplating, but excludes sherardizing.
[2] Quantity withheld to avoid disclosure of individual company operations.
[3] Includes States not individually shown (footnote reference 2).

Consumption of Slab Zinc for Brass Products.—From 1940 through 1950 Connecticut has ranked first among the States consuming slab zinc for brass products; but, owing to the wartime demand for brass and the construction of new plant facilities, there has been some change in the rank of the other leading States. In 1940 Michigan was in second place, followed by New York, Illinois, Ohio, and Pennsylvania among the top six, whereas in 1950 Illinois ranked second, with Michigan in third place, followed by Ohio, New York, and Wisconsin.

TABLE 16.—Consumption of slab zinc for brass products in the United States, 1943–47 (average) and 1948–50, by States [1]

State	Geographic division	1943–47 (average)		1948		1949		1950	
		Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
Alabama	V	68	17	([2])	13	([2])	13	488	13
California	IX	2,054	12	718	11	643	11	1,311	11
Colorado	VIII	37	20	([2])	16	([2])	15	([2])	14
Connecticut	I	95,648	1	46,671	1	34,615	1	59,837	1
Delaware	III								
District of Columbia	III	125	16	([2])	15	([2])	16	([2])	16
Florida	III	1	32						
Georgia	III	5	27	([2])	22	([2])	23	([2])	21
Illinois	IV	29,137	2	13,228	2	12,297	2	15,978	2
Indiana	IV	12,485	7	2,217	10	2,222	9	3,183	9
Iowa	VI	2	30	([2])	27				
Kansas	VI	51	19	([2])	19	([2])	20	([2])	19
Kentucky	V	25	21	([2])	23	([2])	24		
Maine	I	5	28			([2])	26	([2])	24
Maryland	III	6,978	10	544	12	329	12	513	12
Massachusetts	I	5,517	11	2,734	9	2,100	10	2,785	10
Michigan	IV	24,735	3	10,333	3	8,542	3	15,084	3
Minnesota	VI	3	29						
Missouri	VI	304	13	136	14	([2])	14	([2])	15
Nebraska	VI	6	26	([2])	26	([2])	25		
New Hampshire	I	162	15	([2])	20	([2])	17	([2])	22
New Jersey	II	9,903	9	5,643	7	3,481	8	4,077	8
New York	II	18,804	6	7,838	4	6,805	4	9,627	5
Ohio	IV	22,552	5	7,059	5	5,712	5	11,016	4
Oregon	IX	10	25	([2])	24	([2])	21	([2])	18
Pennsylvania	II	11,877	8	4,610	8	3,485	7	7,155	7
Rhode Island	I	11	24	([2])	21	([2])	22	([2])	23
South Carolina	III	22	22	([2])	28				
Texas	VII	15	23	([2])	17	([2])	18	([2])	17
Utah	VIII	2	31					([2])	25
Virginia	III	65	18	([2])	18	([2])	19	8	20
Washington	IX	164	14	([2])	25				
Wisconsin	IV	22,879	4	6,278	6	4,441	6	7,449	6
Total [1]		263,652		[3] 108,429		[3] 85,189		[3] 138,739	

[1] Excludes remelt zinc.
[2] Quantity withheld to avoid disclosure of individual company operations.
[3] Includes States not individually shown (footnote reference 2).

Consumption of Slab Zinc for Zinc-Base Alloys.—The automobile industry is the largest user of zinc-base alloys, principally for die-cast parts and assemblies, such as fuel pumps, carburetors, radiator grilles, windshield wipers, and a wide variety of both interior and exterior hardware. Thus the region embracing Illinois, Indiana, Michigan, Ohio, and Wisconsin, in which the automobile industry is centered, is the area of greatest concentration of slab zinc consumption for zinc-base alloys. Nearly 63 percent of the zinc for die castings and other zinc-base alloy uses in 1950 was consumed in this region.

TABLE 17.—Consumption of slab zinc for zinc-base alloys in the United States, 1943–47 (average) and 1948–50, by States [1]

State	Geographic division	1943–47 (average) Short tons	1943–47 (average) Rank	1948 Short tons	1948 Rank	1949 Short tons	1949 Rank	1950 Short tons	1950 Rank
Alabama	V							(2)	12
California	IX	8,139	8	10,775	8	12,901	7	14,717	7
Connecticut	I	3,423	10	(2)	10	3,466	10	5,535	10
Florida	III	1	20						
Illinois	IV	35,424	1	54,602	1	48,772	1	75,739	1
Indiana	IV	9,127	7	14,958	6	13,082	6	16,677	6
Kansas	VI	29	14						
Maine	I	13	17						
Maryland	III	58	13						
Massachusetts	I	23	15	(2)	14			(2)	14
Michigan	IV	14,853	4	(2)	4	(2)	4	37,302	3
Missouri	VI	9,284	6	12,724	7	(2)	9	11,944	9
New Jersey	II	4,336	9	8,266	9	9,324	8	12,694	8
New York	II	16,973	3	28,312	3	23,220	3	33,356	4
Ohio	IV	24,251	2	42,092	2	39,292	2	52,051	2
Oklahoma	VII	16	16						
Pennsylvania	II	14,697	5	26,429	5	18,601	5	25,600	5
Texas	VII	828	12	(2)	12	(2)	12	(2)	13
Virginia	III	2	19	(2)	13	(2)	13	(2)	15
Washington	IX	8	18						
Wisconsin	IV	2,096	11	(2)	11	(2)	11	(2)	11
Total [1]		143,581		[3] 234,612		[3] 202,163		[3] 289,511	

[1] Excludes remelt zinc.
[2] Quantity withheld to avoid disclosure of individual company operations.
[3] Includes States not individually shown (footnote reference 2).

Consumption of Slab Zinc for Rolled Zinc.—During the period 1940–50, although the quantity of slab zinc consumed for rolled zinc changed widely, the geographic pattern of consumption and rank of the consuming States varied little. Illinois and Indiana ranked first and second, respectively, and accounted for the greater part of slab zinc consumed for rolling in the United States. Pennsylvania held third place through 1946 but was displaced in 1947 and 1948 by Iowa, which moved up from fourth position. In 1949 New York ranked third, but in 1950, it was displaced by Pennsylvania, which moved up to third place again.

Consumption of Slab Zinc for Zinc Oxide.—Because of the small number of companies consuming slab zinc in the manufacture of zinc

TABLE 18.—Consumption of slab zinc for rolled zinc in the United States, 1943–47 (average) and 1948–50, by States

State	Geographic division	1943–47 (average) Short tons	1943–47 (average) Rank	1948 Short tons	1948 Rank	1949 Short tons	1949 Rank	1950 Short tons	1950 Rank
Connecticut	I	1,630	6	(1)	8	(1)	7	(1)	6
Illinois	IV	36,940	1	35,964	1	26,538	1	35,134	1
Indiana	IV	19,092	2	(1)	2	(1)	2	(1)	2
Iowa	VI	6,177	4	(1)	3	(1)	4	(1)	5
Massachusetts	I	1,444	8	(1)	7	(1)	6	(1)	7
New York	II	3,151	5	(1)	5	(1)	3	(1)	4
Pennsylvania	II	7,072	3	(1)	4	(1)	5	(1)	3
West Virginia	III	1,622	7	(1)	6	(1)	8	(1)	8
Total		77,128		76,672		55,200		68,444	

[1] Quantity withheld to avoid disclosure of individual company operations.

oxide and because individual company figures may not be disclosed, it is not possible to show specific quantities consumed in each State. Table 19, however, gives the relative rank of each State and the totals for each year.

TABLE 19.—Consumption of slab zinc for zinc oxide in the United States, 1943–47 (average) and 1948–50, by States

State	Geographic division	1943–47 (average)		1948		1949		1950	
		Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
Illinois	IV	1,925	2	(1)	2	(1)	2	(1)	2
Indiana	IV	1,151	3	(1)	3	(1)	3	(1)	3
Pennsylvania	II	14,124	1	(1)	1	(1)	1	(1)	1
Total		17,200		15,657		10,219		18,187	

[1] Quantity withheld to avoid disclosure of individual company operations.

Consumption of Slab Zinc for Other Uses.—The distribution by States of the quantity of zinc consumed for such purposes as slush castings, wet batteries, desilverizing lead, light-metal alloys (other than zinc-base alloys), zinc dust, sundry chemicals, and bronze powder is shown in table 20.

TABLE 20.—Consumption of slab zinc for other uses in the United States, 1943–47 (average) and 1948–50, by States [1]

State	Geographic division	1943–47 (average)		1948		1949		1950	
		Short tons	Rank	Short tons	Rank	Short tons	Rank	Short tons	Rank
Alabama	V					(2)	12		
Arizona	VIII	19	20						
California	IX	520	5	407	6	268	7	289	10
Colorado	VIII	10	22	(2)	20				
Connecticut	I	258	10	(2)	7	(2)	10	297	9
Idaho	VIII	197	12	(2)	5	(2)	5	(2)	4
Illinois	IV	90	14	(2)	13	(2)	14	(2)	12
Indiana	IV	259	9	(2)	14	46	15	(2)	14
Iowa	VI					(2)	16	(2)	15
Kansas	VI	12	21	(2)	16	(2)	18	(2)	16
Kentucky	V	6	26						
Louisiana	VII	9	24						
Maine	I	24	19						
Massachusetts	I	34	17	(2)	15	(2)	17	11	17
Michigan	IV	344	6	(2)	12	(2)	13	(2)	13
Minnesota	VI	1	29			(2)	21		
Missouri	VI	280	7	226	10	332	6	412	6
Nebraska	VI	907	3	(2)	3	(2)	3	(2)	3
Nevada	VIII	54	16						
New Hampshire	I	10	23						
New Jersey	II	2,011	2	1,931	2	1,671	2	1,914	2
New York	II	278	8	(2)	4	468	4	516	5
Ohio	IV	719	4	271	8	236	8	312	8
Pennsylvania	II	2,181	1	(2)	1	(2)	1	2,809	1
Tennessee	V	202	11	(2)	9	(2)	11	(2)	7
Texas	VII	107	13	(2)	18				
Utah	VIII	3	28	(2)	17	(2)	19	(2)	18
Virginia	III	63	15	(2)	19	(2)	20	(2)	19
Washington	IX	7	25	(2)	11	(2)	9	(2)	11
West Virginia	III	29	18						
Wisconsin	IV	5	27					(2)	20
Total [1]		8,639		[3] 10,428		[3] 7,693		[3] 9,850	

[1] Excludes remelt zinc.
[2] Quantity withheld to avoid disclosure of individual company operations.
[3] Includes States not individually shown (footnote reference 2).

STOCKS

Producers' Stocks.—Inventories of slab zinc at producers' plants declined steadily throughout 1950. By the year end they were reduced to 8,884 tons, the lowest level for any year end since 1925.

TABLE 21.—Stocks of zinc at zinc-reduction plants in the United States at end of year, 1946–50, in short tons

	1946	1947	1948	1949	1950
At primary reduction plants	175,513	67,046	19,179	[1] 90,710	7,920
At secondary distilling plants	756	1,601	1,669	[1] 3,511	964
Total	176,269	68,647	20,848	94,221	8,884

[1] Revised figure.

Consumers' Stocks.—On December 31, 1950, consumers' stocks of slab zinc were 60,349 tons compared with 81,801 tons at the beginning of the year. At the average monthly rate of consumption in 1950, consumers' stocks on hand were approximately 22 days' requirements.

TABLE 22.—Consumers' stocks of slab zinc at plants at the beginning and end of 1950, by industries, in short tons

Date	Galvanizers	Brass mills [1]	Die casters [2]	Zinc rolling mills	Oxide plants	Others	Total
Dec. 31—							
1949	[3] 45,600	[3] 10,307	[3] 18,833	[3] 5,262	803	[3] 996	[3] [4] 81,801
1950	34,191	8,549	13,051	3,190	390	978	[4] 60,349

[1] Includes brass mills, brass ingot makers, and brass product producers.
[2] Includes producers of zinc-base die castings, zinc-alloy dies, and zinc-alloy rods.
[3] Revised figure.
[4] Stocks on Dec. 31, 1949 and 1950, exclude 103 (revised figure) and 512 tons, respectively, of remelt spelter.

PRICES

The market price for Prime Western grade slab zinc at East St. Louis opened in 1950 at 9.87½ cents per pound, then dropped to 9.75 cents on January 17. On March 14 the quotation advanced to 10.00 cents and thereafter continued to rise in ¼- and ½-cent intervals until May 29, when it stood at 13.00 cents. On June 2 a midwestern producer raised its quotation to 14.50 cents; other sellers followed on June 5. On June 12 the price advanced to 15.00 cents and was unchanged until September 7. On that date the quotation was established at 17.50 cents per pound, where it remained the rest of the year.

On December 30, 1949, the British Ministry of Supply established the price of zinc at London at £87 10s. per long ton (equivalent to 10.93 cents per pound computed on the basis of £ equals $2.7975). This price continued until January 25, when it was reduced to £85 10s. (10.68 cents). The uninterrupted uptrend in prices that characterized the remaining months of 1950 began on March 15. On that day the quotation was advanced to £87 10s. (10.93 cents). It was subsequently increased on March 28 to £89 10s. (11.18 cents), April 4 to £91 10s. (11.43 cents), April 20 to £95 10s. (11.93 cents), May 2 to £97 10s. (12.18 cents), May 5 to £99 10s. (12.43 cents), May 10 to

TABLE 23.—Price of zinc concentrates and zinc, 1946–50

	1946	1947	1948	1949	1950
Joplin 60-percent zinc concentrates: [1]					
Price per short ton...dollars..	51.12	66.20	86.37	72.28	87.39
Average price common zinc at—					
St. Louis (spot) [1]...cents per pound..	8.73	10.50	13.58	12.15	13.88
New York [1]...do....	9.15	11.01	14.21	12.86	14.60
London [2]...do....	7.75	12.58	14.38	14.41	14.89
Price indexes (1925–29 average=100):					
Zinc (New York)	128	155	200	181	205
Lead (New York)	109	196	241	206	178
Copper (New York)	93	143	150	131	205
Nonferrous metals [3]	100	142	159	146	125
All commodities [3]	121	155	168	158	164

[1] Metal Statistics, 1951.
[2] E&MJ Metal and Mineral Markets English quotations converted into American money on basis of average rates of exchange recorded by Federal Reserve Board.
[3] Based upon price indexes of U. S. Department of Labor.

TABLE 24.—Average monthly quoted prices of 60-percent zinc concentrates at Joplin, and of common zinc (prompt delivery or spot) St. Louis and London 1949–50 [1]

Month	1949			1950		
	60-percent zinc concentrates in the Joplin region (dollars per ton)	Metallic zinc (cents per pound)		60-percent zinc concentrates in the Joplin region (dollars per ton)	Metallic zinc (cents per pound)	
		St. Louis	London [2]		St. Louis	London [2]
January	110.00	17.50	19.05	56.20	9.81	10.87
February	110.00	17.50	19.05	55.00	9.75	10.68
March	108.61	17.06	19.05	55.59	9.94	10.85
April	91.79	14.06	18.22	61.88	10.70	11.59
May	75.83	11.88	16.60	74.13	11.99	12.89
June	56.63	9.55	14.40	94.66	14.77	15.49
July	51.00	9.36	11.95	99.00	15.00	15.94
August	57.00	10.00	11.41	99.00	15.00	15.94
September	57.69	10.05	11.34	115.00	17.10	17.86
October	52.54	9.32	10.39	115.00	17.50	18.84
November	55.62	9.77	10.78	115.00	17.50	18.88
December	55.30	9.77	10.71	115.00	17.50	18.88
Average for year	[3] 72.28	12.15	14.41	[3] 87.39	13.88	14.89

[1] Joplin: Metal Statistics, 1951, p. 568. St. Louis: Metal Statistics, 1951, p. 565. London: E&MJ Metal and Mineral Markets.
[2] Conversion of English quotations into American money based on average rates of exchange recorded by Federal Reserve Board.
[3] Represents average price realized on total shipments for year.

TABLE 25.—Average price received by producers of zinc, 1946–50, by grades, in cents per pound [1]

Grade	1946	1947	1948	1949	1950
Grade A:					
Special High Grade	9.18	11.10	13.72	12.76	14.30
Regular High Grade	8.81	10.76	13.40	12.29	14.16
Grade B: Intermediate	9.08	11.19	13.49	12.94	14.69
Grades C and D:					
Brass Special	9.00	10.67	13.33	12.75	14.47
Selected	8.89	10.26	13.05	12.87	17.37
Grade E: Prime Western	8.60	10.39	12.93	12.18	14.11
All grades	8.88	10.71	13.32	12.42	14.23
Prime Western; spot quotation at St. Louis [2]	8.73	10.50	13.58	12.15	13.88

[1] Does not include overquota premium payments made by Office of Metals Reserve in 1946–47.
[2] Metal Statistics, 1951, p. 565.

£103 10s. (12.93 cents), May 25 to £107 10s. (13.43 cents), and May 30 to £111 10s. (13.93 cents). On June 5 the price was raised to £123 10s. (15.44 cents per pound on the new basis of £ equals $2.80, established on June 1). Further increases took place on June 16, with the new price at £127 10s. (15.94 cents), and September 8, when the price was placed at £147 10s. (18.44 cents). The final official London price, fixed on October 4, was £151 (18.88 cents).

FOREIGN TRADE [3]

Imports.—Total imports (general imports) of zinc in ores and concentrates in 1950 increased 13 percent over 1949. Of the 272,538 tons of contained zinc imported, 55 percent came from Mexico, 29 percent from Canada, 7 percent from Spain, and 6 percent from Peru. The remaining 3 percent was largely from the Union of South Africa, Australia, and Bolivia.

Slab-zinc imports totaled 155,974 tons, an increase of 23 percent over the quantity imported in 1949. Canada supplied 70 percent, Mexico 17 percent, Norway 5 percent, Belgium-Luxembourg 2 percent, and Italy 2 percent. The remaining 4 percent came principally from the Netherlands, Germany and Peru.

TABLE 26.—Zinc imported into the United States, in ores, blocks, pigs, or slabs, by countries, 1948–50, in short tons [1]

[U. S. Department of Commerce]

Country	1948	1949	1950
Ores (zinc content):			
Argentina	77		8
Australia	495	4,956	2,377
Bolivia	4,515	3,526	2,196
Canada-Newfoundland-Labrador	65,124	61,314	77,585
Guatemala			473
Italy	11,288		
Japan	5,018		
Korea	1,902	168	(2)
Mexico	142,134	[3] 144,101	150,412
Peru	22,475	14,901	17,314
Spain	9,101	4,880	17,738
Union of South Africa	2,035	6,568	3,794
Other countries	39	765	641
Total ores	264,203	[3] 241,179	272,538
Blocks, pigs, or slabs:			
Australia	75	103	
Belgium-Luxembourg	1,145	1,933	3,617
Canada-Newfoundland-Labrador	77,660	109,708	108,937
Germany			1,637
Italy	1,579		2,679
Japan	4,686	1	
Mexico	5,737	14,191	26,293
Netherlands			2,005
Norway	2,240	960	7,939
Peru			1,205
Poland-Danzig	110		358
United Kingdom			555
Yugoslavia			485
Other countries		29	264
Total blocks, pigs, or slabs	93,232	126,925	155,974

[1] Data are general imports which comprise zinc imported for immediate consumption plus material entering country under bond.
[2] Less than 0.5 ton.
[3] Revised figure.

[3] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 27.—Zinc imported for consumption in the United States, 1946–50, by classes [1]

[U. S. Department of Commerce]

Year	Ores (zinc content)		Blocks, pigs, slabs		Sheets		Old, dross, and skimmings [2]		Zinc dust		Total value [3]
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	
1946	166,885	$8,122,471	104,065	$16,481,904	(4)	$10	4,087	$293,375	77	$4,942	$24,902,702
1947	194,822	12,165,163	72,063	14,822,407	1	457	5,105	439,511	-------	-------	27,427,538
1948	133,814	11,737,624	92,495	24,911,454	120	32,871	10,273	1,181,495	41	5,370	37,868,814
1949	109,535	11,748,199	125,564	29,340,620	32	8,144	3,732	558,702	17	4,397	41,660,062
1950	237,081	23,743,502	155,304	38,741,797	211	92,862	2,834	677,154	472	80,564	63,335,879

[1] Excludes imports for manufacture in bond and export, which are classified as "imports for consumption" by the U. S. Department of Commerce.
[2] Includes dross and skimmings as follows: 1946—2,801 tons, $181,918; 1947—4,391 tons, $353,415; 1948—8,637 tons, $873,099; 1949—2,668 tons, $335,283; 1950—1,229 tons, $186,748.
[3] In addition, manufactures of zinc were imported as follows: 1946—$1,929; 1947—$4,429; 1948—$16,056; 1949—$2,583; 1950—$142,369.
[4] Less than 0.5 ton.

Exports.—The value of exports of zinc ores, concentrates, and manufactured articles containing zinc of foreign and domestic origin (excluding galvanized products, alloys, and pigments) amounted to $7,414,904 in 1950 compared with $23,159,259 in 1949. In addition to the items shown in tables 28 and 29, considerable zinc is exported each year in brass, pigments, chemicals, and galvanized iron and steel. Export data on zinc pigments and chemicals are given in the Lead and Zinc Pigments and Zinc Salts chapter of this volume.

Exports of slab zinc in 1950 totaled 12,917 short tons—78 percent under the quantity exported in 1949. India and Pakistan (with 36 percent of the total) and the United Kingdom (with 38 percent) were the major importers. Table 29 contains details of exports of zinc slab and sheet.

TABLE 28.—Zinc ore and manufactures of zinc exported from the United States, 1946–50

[U. S. Department of Commerce]

Year	Zinc ore, concentrates, and dross (zinc content)		Slabs, pigs, or blocks		Sheets, plates, strips, or other forms, n. e. s.		Zinc scrap (zinc content)		Zinc dust	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	89	$15,440	47,224	$8,222,940	13,846	$4,468,328	(1)	(1)	366	$89,439
1947	1,404	215,123	106,669	22,817,004	10,898	4,234,306	(1)	(1)	1,646	448,407
1948	3,547	422,314	65,537	15,852,819	7,344	3,290,410	(1)	(1)	891	299,494
1949	[2] 2,925	[2] 477,718	58,709	18,699,597	7,456	3,496,169	1,570	$224,291	690	261,484
1950	[2] 1,140	[2] 264,907	12,917	3,967,055	4,810	2,322,150	6,212	674,235	506	186,557

[1] Not separately classified before Jan. 1, 1949; formerly included with "Other forms, n. e. s."
[2] Effective Jan. 1, 1949 "dross" included with "scrap."

TABLE 29.—Slab and sheet zinc exported from the United States, by destinations, 1947–50,[1] in short tons

[U. S. Department of Commerce]

Destination	Slabs, pigs, and blocks [1]				Sheets, plates, strips, or other forms, n. e. s.			
	1947	1948	1949	1950	1947	1948	1949	1950
Country:								
Argentina	5, 809	741			890	478		
Austria		213	1, 172			1	9	
Belgium-Luxembourg	7, 971	5, 132	1, 081	67	13	17	19	21
Brazil	1, 735	1, 279	2, 286	830	628	106	85	74
Canada-Newfoundland-Labrador	3	504	10	24	2, 579	3, 584	2, 958	2, 778
Chile	600	980	425	190	291	152	90	18
China	611	44	30		431	106	12	12
Colombia		3	40	3	143	134	214	322
Cuba	182	303	116	274	91	103	71	131
Czechoslovakia	3, 347				726			
Denmark			2, 794	641				
Finland	2, 330		112		19		3	
France	5, 253	2, 205	4, 840			6	(2)	(2)
Germany	392	3, 473	4, 293				49	
India-Pakistan	10, 748	11, 550	12, 608	4, 588	753	548	1, 743	420
Indonesia		1	2		146	242	50	9
Israel		58	19	105	7		54	70
Italy	903	112	319	224				
Malaya					7	137	375	
Mexico	54	61	131	349	628	568	776	575
Netherlands	2, 509	280	4, 028		398	74	230	1
Philippines	1	2	3	4	36	42	63	54
Portugal	269				339	243		
Sweden	2, 454				379	8	25	10
Switzerland	1, 492	1, 273	1, 432	112	241	38	99	11
Tunisia					119			
Turkey	333	6			210	22	2	4
Union of South Africa					93	80	76	37
United Kingdom	59, 289	37, 269	22, 811	4, 941	95	109	40	98
Other countries	384	48	157	565	1, 636	546	413	165
Total	106, 669	65, 537	58, 709	12, 917	10, 898	7, 344	7, 456	4, 810
Continent:								
North America	262	872	267	652	3, 441	4, 374	3, 858	3, 544
South America	8, 153	3, 034	2, 760	1, 026	2, 194	1, 032	505	481
Europe	86, 561	49, 969	42, 994	6, 035	2, 333	577	515	154
Asia	11, 693	11, 662	12, 687	5, 204	2, 131	1, 266	2, 465	591
Africa			1		446	94	104	40
Oceania					353	1	9	

[1] Changes in 1946 data (Minerals Yearbook, 1949, p. 1291): Slabs, pigs, and blocks—France, 112 tons; other countries, 92 tons.
[2] Less than 0.5 ton.

Tariff.—The import duty on zinc-bearing ores in 1950 remained at ¾ cent per pound (zinc content) and on zinc in blocks, pigs, slabs, and dust at ⅞ cent per pound. Congressional action (H. R. 5327) during the latter part of the year suspended the ¾ cent per pound duty on zinc scrap from October 2 until June 30, 1951.

WORLD PRODUCTION

World mine and smelter production of zinc in recent years, insofar as data are available, are shown in tables 30 and 31.

TABLE 30.—World mine production of recoverable zinc, by countries, 1944–50, in metric tons [1]

[Compiled by Viola May Haslacker]

Country [2]	1944	1945	1946	1947	1948	1949	1950
Algeria	1,010	1,906	3,858	6,639	6,391	6,501	7,136
Argentina	18,945	13,134	14,724	16,230	12,189	10,921	12,699
Australia	177,156	152,726	174,669	185,183	193,526	184,919	196,360
Austria	3,991	1,071	608	1,805	3,154	2,694	2,970
Belgian Congo	16,405	24,848	36,258	41,088	46,584	55,420	76,312
Bolivia (exports)	16,319	20,975	19,188	14,612	21,124	17,629	19,570
Canada	249,848	234,603	213,469	188,569	212,429	261,506 (Canada and Newfoundland)	283,571 (Canada and Newfoundland)
Newfoundland	53,952	51,409	49,433	40,115	39,253		
Finland [3]	2,900	1,500	1,900	2,200	2,500	2,500	1,800
France	2,535	3,345	4,846	5,822	5,395	11,159	12,419
French Equatorial Africa	500	621	----------	----------	----------	44	621
French Indochina	1,405	380	----------	----------	----------	----------	----------
French Morocco	1,170	980	1,693	1,838	1,671	2,845	12,521
Germany:							
Federal Republic	250,000 (Federal Republic and Soviet Zone)	24,385	22,212	22,308	28,920	57,816	69,298
Soviet Zone		(4)	(4)	(4)	(4)	(4)	(4)
Greece	585	747	345	1,259	1,400	1,695	3,184
Italy	21,284	10,297	29,200	57,794	74,200	73,800	85,348
Japan	74,208	22,680	21,048	29,532	33,431	44,314	52,032
Korea, South	8,195	2,880	----------	800	221	----------	(4)
Mexico	218,965	209,940	139,535	195,814	179,029	178,402	223,530
Nigeria	----------	----------	----------	6	363	72	----------
Northern Rhodesia [5]	14,712	15,485	17,466	21,479	22,526	23,217	23,080
Norway	5,054	1,835	4,311	5,637	6,320	6,610	6,900
Peru	56,781	61,154	59,736	58,181	58,842	72,037	73,812
Poland [5]	(4)	36,385	56,614	71,756	87,089	(4)	(4)
South-West Africa [6]	----------	----------	----------	5,385	10,600	12,700	11,500
Spain [3]	34,000	31,000	38,000	41,000	47,000	50,000	64,000
Sweden	32,909	33,600	37,821	35,925	35,485	35,158	36,714
Tunisia	742	767	1,554	2,703	2,382	3,315	2,932
U. S. S. R. [3 5]	84,000	89,000	90,000	106,000	110,000	110,000	128,700
United Kingdom	8,802	3,619	----------	----------	----------	----------	----------
United States	651,938	557,333	521,477	578,425	571,503	538,142	565,513
Yugoslavia	[3] 16,257	7,711	22,407	35,017	35,924	36,559	[3] 43,500
Total (estimate) [2]	2,060,000	1,616,000	1,582,000	1,773,000	1,850,000	1,885,000	2,115,000

[1] Data derived from the United Nations Statistical Yearbook, Yearbook of the American Bureau of Metal Statistics, and other sources.
[2] In addition to the countries listed, Czechoslovakia, North Korea, Rumania, and Turkey also produce zinc, but no estimates for them are included in the totals.
[3] Estimate.
[4] Data not yet available; estimate by author of chapter included in total.
[5] Smelter production.
[6] Zinc content of lead-copper ore sorted from dumps, plus jig concentrates derived from the same source.

TABLE 31.—World smelter production of zinc, by countries, 1944–50, in metric tons

[Compiled by Viola May Haslacker]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Argentina	976	983	1,814	2,631	1,602	2,648	[2] 7,530
Australia	79,979	85,118	77,541	70,535	82,617	82,255	85,146
Belgium	8,660	11,712	79,325	[3] 133,011	[3] 153,928	[3] 176,565	[3] 177,326
Canada	152,876	166,302	168,448	161,367	178,329	186,920	185,935
China	331	328		320	330	(4)	(4)
Czechoslovakia	(5)	3,300	(4)	1,964	(4)	(4)	(4)
France	8,793	8,414	31,014	46,007	56,067	60,597	71,531
Germany: [5]							
Federal Republic	259,600 (Federal Republic and Soviet Zone)	(4)	[3 6] 14,855	[3 6] 20,723	[3 6] 41,352	[3] 86,916	112,791
Soviet Zone			(4)	(4)	(4)	(4)	(4)
Indochina	[2] 622						
Italy	6,100	1,517	15,706	22,849	26,397	26,612	38,119
Japan	[7] 60,550	[7] 30,000	11,253	14,849	21,200	32,318	49,008
Mexico	49,248	48,985	41,982	56,749	48,323	53,496	53,492
Netherlands	2,105		2,011	9,532	13,588	15,614	19,752
Northern Rhodesia	14,712	15,485	17,466	21,479	22,526	23,217	23,080
Norway	11,777	9,228	30,210	34,580	42,000	41,040	44,000
Peru	1,447	1,583	936	1,013	1,464	1,261	1,262
Poland	(5)	36,385	56,614	71,756	87,089	(4)	(4)
Spain	18,054	17,310	17,568	19,825	21,203	19,551	21,264
Sweden	1,790	2,929					
U. S. S. R.[2]	84,000	89,000	90,000	106,000	110,000	110,000	128,700
United Kingdom	72,192	63,024	66,569	69,392	73,138	65,124	71,418
United States	788,613	693,594	660,665	728,007	714,644	739,154	765,176
Total (estimate) [1]	1,622,000	1,302,000	1,386,000	1,595,000	1,698,000	1,811,000	1,943,000

[1] In addition to the countries listed, Rumania and Yugoslavia produce zinc, but no estimates for them are included in the totals. Rumania produced about 2,300 metric tons in 1947, and Yugoslavia about 5,000 tons annually prewar.
[2] Estimated.
[3] Includes production from reclaimed scrap.
[4] Data not available; estimate by senior author of chapter included in total.
[5] Data for Austria, Czechoslovakia and Poland in 1944 included with Germany.
[6] American and British zones only.
[7] Yearbook of American Bureau of Metal Statistics, 1950.

Minor Metals

By Jack W. Clark[1]

BARIUM AND STRONTIUM

DOMESTIC producers of barium and strontium metal and their getter-alloys during 1950 were Kemet Division, Union Carbide & Carbon Corp., Cleveland, Ohio, and King Laboratories, Inc., Syracuse, N. Y. Production of barium amounts to several thousand pounds annually; strontium output is usually negligible. (Barium and strontium minerals and chemical compounds are discussed in the Barite and Minor Nonmetals chapters, respectively, of this volume.)

Uses.—Barium and, occasionally, strontium are consumed almost exclusively in getter-alloys used for evacuative electronic tubes or other devices requiring vacuum. Pure barium is chemically unstable, hence is ordinarily alloyed with magnesium and aluminum, the former giving a lower flashing point and the latter conferring stability. A composition commonly used for high-speed vacuum-tube production contains the afore-mentioned metals in the approximate weight ratio of 1Ba:1Al:2Mg. The ideal getter is one having the highest practical barium content, which, in certain types of getter-alloys, may range up to 75 percent by weight. Special types may contain other elements to an appreciable degree, such as copper, iron, nickel, calcium, and beryllium.

Prices.—During 1949 and 1950 a major distributor quoted barium at $6 per pound in lots of more than 1,000 pounds and strontium at $10 in 500-pound lots. The foregoing prices were for cast billets, with extruded rods $1 per pound higher in each instance.

Technology.—Procedures were published for making barium and its alloys [2] and for vaporizing the element in vacuum tubes.[3]

Canada.—Dominion Magnesium, Ltd., Haley's Station, near Ottawa, Ontario, reported production of 2,116 pounds of barium in 1949, which compared with 10,652 pounds in 1948 and 1,040 in 1947. No strontium was produced in 1949. Data on 1950 Canadian production of barium and strontium are not available. Cooper Metallurgical Associates, Cleveland, Ohio, distributes Canadian-produced barium and strontium in the United States.

---

[1] Deceased. Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce. Titles of publications, cited in footnotes, enclosed in parentheses are translations from the language in which they were originally published.

[2] Compagnie de Produits et Electrometallurgique Alais, Froges et Camargue (Barium and Its Alloys): French Patent 935,324, June 16, 1949.

[3] N. V. Philips Gloeilampenfabrieken (Coating of Vacuum Tubes with Active Barium): Netherlands Patent 63,039, May 15, 1949.

Jenkins, R. O., and Newton, R. H. C., Elemental Barium in Oxide Cathodes: Nature, vol. 163, No. 4145, Apr. 9, 1949, p. 572.

BERYLLIUM

Mine Production.—Mine shipments of beryl in the United States during 1950 were the largest on record, totaling 559 short tons. Consumer demand for beryl ore in 1950 was probably at the highest level ever attained, increased prices and production reflecting the demand.

The Harding mine near Dixon, N. Mex., was by far the largest individual producer of beryl during the year; nearly 200 tons of beryl were produced by Flaudio Griego, operating the property for Arthur Montgomery. According to Bureau of Mines records, the 1950 beryl production of the Harding mine was the highest annual output from a single mine ever achieved in the United States. Solely as a result of the Harding mine performance, New Mexico ranked first among the States in beryl production in 1950; New Hampshire, Colorado, and South Dakota were about equal in output, followed by Maine and Arizona. Shipments were reported in 1950 from New Hampshire by Ashley Mining Co., Beryl Mountain mine, South Acworth; Whitehall Mining Co., Ruggles quarry, near Grafton; and Beryllium Development, Inc., John Hill mine, near Grafton Center. Principal Colorado producers were Beryllium Mining Co., New Anniversary claims, near Ohio City, Gunnison County; Ralph Hermstain, Devil's Hole mine, near Texas Creek, Fremont County; and Consolidated Feldspar Corp., from various unspecified properties. Beryl Ores Co., Arvada, Colo., continued to beneficiate subspecification beryl ore and to grind beryl for use in the ceramic trade. Production in the Black Hills area of South Dakota came from a large number of mines: Beecher, Parker, Ingersoll, Peerless, Gold Star, Dike Lode, Ferguson, Frozen Foot, "The Mick," Johnson, and others undesignated. Largest individual producers were Keystone Feldspar & Chemical Co. (Peerless), Black Hills Keystone Corp. (Ingersoll), and Lawrence Sears (Johnson), all near Keystone, and George Bland (Beecher), near Custer. A small production of beryl was realized during 1950 in New York, North Carolina, and Massachusetts, but was not shipped. The Idaho Beryllium & Mica Corp. began to construct a 50-ton mica mill in the Avon mining district northeast of Troy, Latah County, Idaho, with the intention of recovering beryl as a coproduct. In the New England, Black Hills, and Colorado areas the Bureau of Mines continued studies throughout 1950 devoted to improving methods used in sampling, mining, and milling pegmatite ores. In Maine, beryl was shipped by Northern Mining Corp., Bumpus quarry, and Whitehall Mining Co., Newry N-40 mine, both near Bethel.

TABLE 1.—Historical statistics on beryllium concentrates (beryl) in the United States, 1935–50 [1]

[Compiled by Jack W. Clark and Stanley Needleman]

Year	Domestic production [2]			Imports for consumption			Exports (short tons)	Total supply (short tons)	Domestic consumption (short tons)
	Short tons [2]	Value		Short tons	Value				
		Total	Average per ton		Total	Average per ton			
1935	83	(3)	[4] $30–35	(3)	(3)	(3)	(5)	(3)	[6] 200
1936	28	(3)	[4] 30–35	162	$6,681	$41.24	(5)	[7] 190	[6] 200
1937	75	$1,640	21.87	182	8,031	44.13	(5)	[7] 257	[6] 300
1938	25	770	30.80	146	5,990	41.03	(5)	[7] 171	[6] 500
1939	95	2,720	28.63	459	14,574	31.75	(5)	[7] 554	[6] 600
1940	121	3,721	30.75	810	[6] 23,865	[6] 29.46	(5)	[7] 931	[6] 1,200
1941	158	7,300	46.20	2,666	143,992	54.01	(5)	[7] 2,824	[6] 2,352
1942	269	24,188	89.92	2,050	137,597	67.12	0.8	2,318	[6] 3,058
1943	356	44,407	124.74	4,840	377,726	78.04	2.5	5,193	(8)
1944	388	56,135	144.68	3,115	286,091	91.84	9.5	3,493	(8)
1945	39	6,133	157.26	1,201	131,841	109.78	.1	1,240	1,738
1946	100	17,787	177.87	1,188	105,708	88.98	1.4	1,197	1,013
1947	145	25,214	173.89	767	114,667	149.50	.2	912	1,735
1948	99	26,600	268.69	1,720	299,375	174.06	.1	1,819	[6] 1,970
1949	346	111,073	321.02	3,811	858,308	225.22	.3	4,157	[6] 1,029
1950	559	170,550	305.10	4,683	1,181,831	252.37	.1	5,242	[6] 3,007

1 Data on stocks are not shown, the figures being either confidential or incomplete.
2 Mine shipments.
3 Data not available.
4 Trade-journal quotations.
5 Not separately classified before 1942.
6 Estimate.
7 Disregarding exports, which are believed to have been negligible.
8 Data confidential.

TABLE 2.—Beryllium concentrates (beryl) shipped from mines in the United States, 1944–50, by States, in short tons

State	1944	1945	1946	1947	1948	1949	1950
Colorado	35			(1)	(1)	100	97
Maine	2			(1)	(1)	(1)	(1)
Massachusetts	4						
New Hampshire	(1)	1	5	(1)	(1)	(1)	106
New Mexico	29			(1)		8	(1)
South Dakota	306	38	95	70	45	69	96
Other [2]	12			75	54	169	260
Total:							
Short tons	388	39	100	145	99	346	559
Value	$56,135	$6,133	$17,787	$25,214	$26,600	$111 073	$170,550
Average value per ton	$144.68	$157.26	$177.87	$173.89	$268.69	$321.02	$305.10

1 Included with "Other," to avoid disclosure of individual company operations.
2 Includes States indicated by footnote reference 1; in addition, 1944, Connecticut, North Carolina, and Virginia; 1947, Connecticut; 1949, Arizona and North Carolina; 1950, Arizona.

Refinery Production.—Companies producing beryllium products are as follows:

Producer and plant location:	*Products*
A. O. Smith Co., Milwaukee, Wis.	Ceramics.
Beryllium Corp., Reading, Pa.	Beryllium-copper master alloy (4% Be); beryllium-copper (0.25–2.85% Be) strip, sheet, rod wire, castings, and safety tools; beryllium nickel, beryllium-aluminum, and beryllium-aluminum-magnesium master alloys; beryllium metal; beryllium oxide and compounds.
Beryl Ores Co., Arvada, Colo.	Ground beryl; beryllium oxide.
Brush Beryllium Co., Cleveland and Luckey, Ohio.	Beryllium metal, oxide, compounds, and ceramics; beryllium-nickel. Company plans to reenter field of beryllium master-alloy production.
Champion Spark Plug Co., Detroit, Mich.	Ceramics.
Clifton Products Co., Painesville, Ohio.	Special beryllium products; research in field of beryllium; maintains standby plant for production of beryllium oxide and chemicals.
Consolidated Car Heating Co., Albany, N. Y.	Ticonium alloy (Ni-Co-Cr-Mo, 1–6% Be).
Foote Mineral Co., Philadelphia, Pa.	Ground beryl.
General Electric Co., Schenectady, N. Y.	Trodaloy No. 1 (0.40% Be, 2.6% Co, balance Cu); Trodaloy No. 7 (0.10% Be, 0.40% Cr, balance Cu); beryllium stainless steel (Turbelloy No. 4, 0.7% Be).
Illinois Zinc Co., Chicago, Ill.	Zn cube alloy (0.1% Be, 2–2.5% Cu, balance Zn).
Riverside Metal Co., Riverside, N. J.	Beryllium-copper wire, sheet, and strip.

Important papers were published during 1950 dealing with the occurrence of beryl in Colorado, Idaho, Montana, New Hampshire, Utah and Wyoming.[4]

Economic aspects of pegmatites were discussed in detail in a Bureau of Mines circular.[5]

Consumption and Uses.—Domestic consumption of beryl in 1950 was the highest in the history of the industry and provided a sharp contrast to the low consumption in 1949. Toward the end of 1950 demand for beryllium products, principally beryllium-copper, began to outrun supplies of beryl ore available to consumers. That this predicament arose during a peak year of ore supply was accounted for in significant measure by vigorous activity of the Government in obtaining beryl for the National Strategic Stockpile and for the Atomic Energy Commission. The Emergency Procurement Service of the General Services Administration serves as purchasing agent for the Strategic Stockpile, and the Brush Beryllium Co., Cleveland, Ohio, performs a similar function for the Atomic Energy Commission.

[4] Wemlinger, Charles A., Colorado Pegmatite Deposit Yields Beryl and Mica: Eng. and Min. Jour., vol. 151, No. 11, November 1950, pp. 92–94.
Stoll, W. C., Mica and Beryl Pegmatites in Idaho and Montana: Geol. Survey Prof. Paper 229, 1950, 64 pp.
Olson, J. C., Feldspar and Associated Pegmatite Minerals in New Hampshire: Mineral Resources Survey, New Hampshire State Planning and Development Commission, part 14, 1950, 50 pp.
Hanley, John B., Heinrich, E. William, and Page, Lincoln R., Pegmatite Investigations in Colorado Wyoming, and Utah, 1942–44: Geol. Survey Prof. Paper 227, 1950, 125 pp.

[5] Tyler, Paul M., Economic Importance of Pegmatites: Bureau of Mines Inf. Circ. 7550, 1950, 57 pp.

Material in the Strategic Stockpile cannot be released for consumption without Presidential order. Other factors that accentuated consumers' difficulties in acquiring an adequate ore supply were (1) continuance of a dual economy in which it was presumed that both normal commercial and growing military demands could be simultaneously satisfied, and (2) increased difficulty of consumers in obtaining export licenses for ore shipments from Brazil, the major source of beryl supply for the United States.

The major use for beryllium is in the form of an alloying element with copper, in which role its function has been likened to that of carbon in the formation of steel. Addition of fractional percentages, up to a few percent, of beryllium to copper forms a series of heat-treatable, high-strength, high-conductivity alloys of almost unequaled utility in fields where such properties are desired.

Beryllium, a steel-gray, light metal, hard enough to scratch glass, has no commercial uses as yet that require it in quantity. Small quantities are used in radiography, because of the transparency of beryllium to X-rays, and in neutron-generating sources composed of beryllium and certain radioactive elements emitting alpha radiation. Beryllium metal, oxide, carbide, and other compounds are of major interest in the atomic energy program for undisclosed applications.

Beryllium oxide is an unusual refractory substance, with heat conductivity equivalent to that of certain metals and a high melting point. It has aroused considerable interest in research programs devoted to developing ceramics and ceramic-metal (cermets and ceramels) combinations, sought for superduty service in jet engine and gas turbines.

Stocks.—Quantitative data on industry or Government stocks of beryl are not available for publication. The year 1950 saw a sharp rise in Government holdings and a correspondingly sharp drop in industry stocks. Although the aggregate of Government-industry stocks was favorable from the standpoint of numerical requirements, the fact that beryl contained in the National Strategic Stockpile was not available, without Presidential sanction, to an industry faced with mounting military orders created a serious supply situation near the end of 1950.

Prices.—E&MJ Metal and Mineral Markets quoted domestic beryl ore in 1950, f. o. b. mine, per unit BeO, 10–12 percent BeO, as follows: January 5, \$35 (Colorado); \$25–\$30 (North Carolina); May 11, nominal (Colorado); September 14, \$26–\$30 (North Carolina); December 21, \$28–\$30 (North Carolina). For imported ore, c. i. f. United States ports, per unit BeO, 10–12 percent BeO: January 5, \$26–\$30; April 27, \$26–\$28; May 11, \$26; December 14, \$26–\$30; December 21, \$28. Published prices for domestic beryl are only roughly indicative of average prices actually paid by consumers. In general, the higher figures quoted above were paid for beryl having an exceptionally high BeO content or for beryl destined for use in ceramics where consumption is relatively small and ore cost is not of paramount importance.

Beryllium-copper master alloy, 4 percent Be, opened the year at \$24.50 per pound of contained Be and increased on July 14 to \$30.

On November 15 prices increased further, with master alloy quoted at $1.56 per pound of alloy (a changeover from the previous practice of quoting on the basis of contained beryllium). On the latter date, beryllium-magnesium-aluminum and beryllium-aluminum master alloys were quoted at $55 and $69 per pound of contained beryllium, respectively. Beryllium metal, technical-grade pebbles, was offered at $65 per pound during 1950; premium grade was quoted at $85.

Foreign Trade.—United States imports of beryl in 1950 were the second highest on record, nearly equaling the peak year 1943, when 4,840 short tons were received. The Union of South Africa, South-West Africa, and Southern Rhodesia achieved first-rank importance as sources of beryl for United States consumers. All indications pointed to the African Continent continuing as a major supplier of beryl in future years.

Exports of beryllium metal, alloys, and scrap from the United States in 1950 totaled 220,918 pounds, valued at $307,929. Of this quantity, 143,366 pounds went to the United Kingdom, 24,808 to Sweden, 41,228 to Canada, and the remainder to eight other countries.

TABLE 3.—Beryllium ore (beryl concentrates) imported for consumption in the United States by countries, 1936–50, in short tons

[U. S. Department of Commerce]

Year	Argentina	Australia	Brazil	India	Mozambique	Southern Rhodesia	Union of South Africa (includes South-West Africa)	Other	Total	
									Short tons	Value
1936	154	--------	2	--------	--------	--------	6	--------	162	$6,681
1937	152	--------	--------	30	--------	--------	--------	--------	182	8,031
1938	78	--------	--------	58	--------	--------	10	--------	146	5,990
1939	384	--------	75	--------	--------	--------	--------	--------	459	14,574
1940	422	--------	377	--------	[1] 5	--------	6	--------	810	23,865
1941	861	--------	1,805	--------	--------	--------	--------	--------	2,666	143,992
1942	703	--------	912	397	--------	--------	38	--------	2,050	137,597
1943	1,162	457	2,551	509	--------	--------	86	[2] 75	4,840	377,726
1944	229	518	1,453	892	--------	7	(3)	[4] 15	3,115	286,091
1945	--------	105	572	484	--------	--------	--------	[5] 40	1,201	131,841
1946	53	20	996	119	--------	--------	--------	--------	1,188	105,708
1947	--------	45	722	--------	--------	--------	--------	--------	767	114,667
1948	55	--------	1,545	--------	55	--------	47	[6] 18	1,720	299,375
1949	--------	--------	3,264	--------	107	--------	290	[7] 150	3,811	858,308
1950	--------	--------	2,543	--------	130	464	1,401	[8] 145	4,683	1,181,831
Total, 1936–50	4,253	1,145	16,817	2,489	297	471	1,884	444	27,800	3,696,277
Percent	15.3	4.1	60.5	8.9	1.1	1.7	6.8	1.6	100.0	--------

[1] Figure reported to Bureau of Mines; value not included in total value figure.
[2] Madagascar, 74 short tons; Portugal, 1 ton.
[3] Less than 1 ton.
[4] British East Africa (principally Uganda), 15 tons; Anglo-Egyptian Sudan, less than 1 ton.
[5] British East Africa (principally Uganda), 7 tons; Madagascar, 11 tons; Nigeria, 22 tons.
[6] Hong Kong, 18 tons (country of export only—ore produced principally in Brazil and Argentina before, or during, World War II); Chile, less than 1 ton.
[7] British East Africa, 11 tons; French Morocco, 22 tons; Japan, 107 tons; (country of transshipment only, *see* footnote 6 on Hong Kong for original source); Norway, 10 tons.
[8] British East Africa (principally Uganda), 11 tons; Canada, 29 tons; French Morocco, 77 tons; Portugal, 28 tons.

Technology.—Because of its significance in atomic energy applications and its relatively difficult fabrication, beryllium metal has been the subject of extensive research in recent years. Several papers were published in 1950 covering methods for its fabrication into large shapes by powder metallurgy [6] and its extrusion into rods and tubing.[7] A patent was issued covering a method for brazing beryllium.[8] The effect of beryllium as an alloying additive in stainless steel (0.09–1.73 percent Be),[9] and in sand-cast aluminum-magnesium alloy (up to 0.20 percent Be) was reviewed.[10]

Beryllium oxide received its share of attention in 1949–50 with publication of a paper describing its physical properties [11] and issuance of patents pertaining to procedures for its fusion,[12] purification,[13] and extraction from crude ore.[14] The beneficiation of low-grade beryl ore by nuclear techniques continued to receive attention; it was concluded, however, that practical application awaited development of a less costly source of gamma radiation and of a mechanical device suitable for handling the crushed feed material at a uniform rate.[15]

WORLD REVIEW

North America.—Although numerous beryl occurrences of possible commercial value exist in Canada, a token production only, principally for promotional purposes, was reported before 1950. In view of this situation, an event of some significance was importation into the United States in 1950 of 29 tons of beryl mined recently, in Ontario Province. Northern Canada Mines, Ltd., and Kirkland Lake Gold Mining Co. became joint holders of options on a beryl prospect near Mont Laurier, Quebec, about 100 miles north of Ottawa; exploration was planned to begin early in 1951.[16] Long-term plans of Northern Chemicals, Ltd. (controlled by Lithium Corp. of America), Winnipeg, include construction of a selective flotation plant for recovering beryl as a coproduct with spodumene, mica, and feldspar in the Cat Lake area of Manitoba.[17]

---

[6] Seybolt, A. U., Frandsen, J. P., and Linsmayer, R. M., Hot-Pressing Beryllium Powder: Steel, vol. 126, No. 13, Mar. 27, 1950, pp. 71–74, 96.
Hausner, Henry H., and Pinto, Norman P., Powder Metallurgy of Beryllium: Trans. Am. Soc. Metals, Prepr. 38, 1950, 18 pp.

[7] Gurenisky, D. G., Chapin, J. H., Yancey, R. W., Foote, F. G., Bethke, H., and Kaufmann, H. R., The Extrusion of Beryllium: U. S. Atomic Energy Commission (AECD-2883), January 1946 (declassified August 2, 1950), 29 pp.

[8] Warner, J. G. (assigned to Machlett Laboratories, Inc.), Method for Brazing Beryllium: U. S. Patent 2,534,643, Dec. 19, 1950.

[9] Metal Progress, Carbon-Beryllium Steels: Vol. 57, No. 2, February 1950, pp. 254–257.
Corson, Michael G., Some Experiments on Beryllium Steels: Metal Prog., vol. 57, No. 2, February 1950, pp. 211–212.

[10] Mincher, A. L., Effect of Beryllium on D. T. D. 300: Metal Ind., vol. 76, No. 22, June 2, 1950, pp. 435–436.

[11] Gangler, James J., Some Physical Properties of Eight Refractory Oxides and Carbides: Jour. Am. Ceram. Soc., vol. 33, No. 12, Dec. 1, 1950, pp. 367–375.

[12] Schormuller, Anton, and Windecker, Charles E. (assigned to Clifton Products, Inc.), Method of Producing Fused Beryllium Oxide: U. S. Patent 2,467,159, Apr. 12, 1949.

[13] Mahn, John G., and Hutchinson, Jr., Clyde A. (assigned to the U. S. Atomic Energy Commission), Purification of Beryllium Oxide: U. S. Patent 2,531,143, Nov. 21, 1950.

[14] Schormuller, Anton (assigned to Clifton Products, Inc.), Process of Recovering Beryllium Oxide from Beryllium Ore: U. S. Patent 2,459,895, Jan. 25, 1949.

[15] Gaudin, A. M., Dasher, John, Pannell, James H., Freyberger, Wilfred L., Use of an Induced Nuclear Reaction for the Concentration of Beryl: Trans. Am. Inst. Min. and Met. Eng., vol. 187, April 1950, Mining Eng., pp. 495–498.

[16] Northern Miner, vol. 36, No. 39, Dec. 21, 1950, p. 2.

[17] Springer, G. D., Mineral Deposits of the Cat Lake-Winnipeg River Area: Province of Manitoba, Dept. of Mines and Natural Resources (Mines Branch), Pub. 49-7, 1950, pp. 8–12.

TABLE 4.—World production of beryllium concentrates (beryl), by countries, 1935–50,[1] in metric tons

[Compiled by Jack W. Clark, Berenice B. Mitchell, and Stanley Needleman]

Country	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Argentina	189	300	260	753	299	520	2,186	925	881	342	190	130	10	[2] 50	(3)	(3)
Australia					6	2	3		534	417	47	19	54	56	36	[4] 23
Brazil [5]		4		223	504	1,472	1,703	1,634	2,027	1,185	510	1,294	1,027	1,783	3,078	2,625
French Morocco														51	160	56
India	126	89	24	18	9	53	(6)	121	1,486	508	108	112	(3)	(3)	(3)	(3)
Korea, South						(3)	(3)	(3)	(3)	17	9	(3)	(3)			
Madagascar	[7] 10	[7] 10	[7] 2	[7] 2	(3)	(3)	(3)	(3)	[2] 67	50	[2] 10	(3)	(6)	9	27	486
Mozambique						[2] 5	(3)	8	6	3	2	22	61	81	136	260
Portugal	2	2	21	27	(3)	(3)	35	(3)	14	[8] 60	9	(3)		[8] 10	[8] 20	[8] 49
Southern Rhodesia										[2] 6					23	846
South-West Africa	(3)	(3)	(3)	(3)	(3)	(3)	20	39	36	1	5		52	90	239	659
Spain						4	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Uganda				(3)	(3)	(3)	(3)	(3)		18	4		18	44	34	44
Union of South Africa	[8] 80	[8] 5	(3)	(3)	(3)	[8] 5	(3)	[8] 34	[8] 78	(3)	(3)				223	844
United States (mine shipments)	75	25	68	23	86	110	143	244	323	352	35	91	132	90	314	507
Other countries [9]		(10)	(10)	(10)	(10)					(11)	[12] 20			[13] 4	[14] 10	[15] 38
World total (estimate)	482	435	375	1,046	904	2,171	4,090	3,005	5,452	2,959	985	1,700	1,430	2,350	4,470	6,640

1 In addition to countries here covered, beryllium concentrates have been, or are being, produced in Finland and the U. S. S. R. Production has also been indicated in past years from British Somaliland, Kenya, Italy, Rumania, and China (Manchuria). No production data are available for any of these countries; however, except for the U. S. S. R., their aggregate output is not believed to be significant.

For years before 1935 production for certain countries has been reported as follows: Argentina, 1932—10 tons, 1933—none, 1934—none; Brazil, 1924-34, 12 tons; Canada, 1926—2 tons (exports), 1927—2 tons (exports); India, 1932—281 tons, 1933—324 tons, 1934—551 tons; Madagascar, 1916—6 tons, 1920—522 tons, 1925—20 tons (exports), 1928-34, inclusive, annual exports of about 15 tons are estimated; South-West Africa, 1933-34, 50 tons reported produced at Steinkopf; Union of South Africa, 1929—20 tons.

2 United States imports.

3 Data not available; estimates by chapter author included in world totals for 1945-50.

4 Preliminary figure.

5 Exports.

6 Less than 1 ton.

7 Estimated exports.

8 Estimated.

9 Covers Afghanistan, Anglo-Egyptian Sudan, Canada, Chile, France, Nigeria, Northern Rhodesia, Norway, and Tanganyika. *See also* footnote 1.

10 Canadian production of beryl unofficially reported as follows: 1936, 18 tons; 1937, 18; 1938, 9; 1939, 161. The reliability of these figures, however, is questionable, and they are not therefore included in the tabulation.

11 Anglo-Egyptian Sudan, less than 1 ton (United States imports).

12 Nigeria (United States imports).

13 France, 2 tons; Tanganyika, 2 tons (exports); Chile, less than 1 ton (United States imports).

14 Norway, 9 tons (United States imports); Tanganyika, 1 ton (exports); France, data not available (estimate by chapter author included in world total).

15 Afghanistan, 7 tons; Canada, 26 tons (United States imports); Northern Rhodesia, 5 tons; France, data not available; (estimate by chapter author included in world total).

South America.—The famed Las Tapias mine of Argentina, probably the largest individual producer of beryl in the world, is in the western part of Cordoba Province, a few miles northeast of Villa Dolores. Total beryl production from Las Tapias during 1937–42 was about 3,500 tons. Numerous other pegmatites in the vicinity are reported to contain beryl. The adjacent San Luis Province has also been a significant producer of beryl ore.

In recent years, movement of Argentine beryl to foreign consumers has been hampered by numerous legal restrictions. Executive Decree 9.594 of May 13, 1950, specifically places beryllium under State control with regard to both exploitation and ultimate destination. In Resolution 1.161/50 of August 10, 1950, complying with Decree 9.594, the Argentine Industrial Credit Bank was empowered to purchase, for the account of the Argentine Institute for the Promotion of Trade (AIPT), all stocks of beryl then in the hands of nonproducers, paying a maximum price of 500 pesos per metric ton. Producers of beryl were authorized to receive a price of 800 pesos per ton henceforth. From stocks accumulated through such purchases, it was stipulated that part be retained as a domestic reserve, the remainder to be made available for export through AIPT.

Vigorous promotion and development of beryl pegmatites in the east-central part of Minas Gerais State, Republic of Brazil, during the late 1940's resulted in that area equaling the output of the famed Northeastern States in 1949 and surpassing that production in 1950. In part, the ascendancy of Minas Gerais over the northeastern area was brought about by a major decline in beryl production in the States of Paraíba, Rio Grande do Norte, and Ceará. During the peak years 1940–44 about 400 mines are reported to have been operating in the northeast, compared with a small fraction of that number in recent years. Numerous reasons have been cited to account foı the decline, such as lack of pıice incentive, poor market for associated tantalite, competition of other industries for labor supply, and lack of equipment.

Chamber of Deputies Bill 290/50 of the Brazilian National Congress decreed creation of the National Council of Research. Bill 290 became Law 1310 of January 15, 1951, upon its publication in the Diario Oficial on January 16. The law gives the council general authority over materials needed for atomic energy, stating beryllium to be one such material. It further decrees that beryllium ore may be exported only by permission of the President of Brazil after consideration by specialized Government departments. Thus, legislative expression was given to the long-standing desire of various Brazilian groups to conserve certain raw materials for domestic processing or end-use. The Orquima Co., engaged in chemical processing of monazite sand at São Paulo, was giving long-range consideration to similarly processing beryl ore. In addition, a smaller company was laying similar plans for an operation in São Paulo.

Undeveloped beryl deposits were reliably reported to exist in the interior highlands of Surinam (Netherlands Guiana), near the Brazilian border.

Europe.—Important deposits of beryl were reported to have been found in France, north of the hamlet of La Vedrenne, between Ambozac and Bessines, in the Haute-Vienne, north of Limoges.[18] Beryllium copper is included among the products to be made by Vacuumschmelze, A. G., Western Germany. The company is successor to Heraeus Vacuumschmelze, A. G., whose works were damaged severely by bombing during World War II. Reconstruction of the damaged facilities is reported nearly complete.[19]

Africa.—Important beryl deposits are found at Muiane, Alto Ligonho, Mozambique. Beryl also occurs at Ribaue, in Nyassa Province.[20] The first production of beryl in Northern Rhodesia was reported in 1950—an output of 5 tons from an undesignated locality. Beginning with a modest output of only 25 short tons of beryl in 1949, Southern Rhodesia emerged in 1950 as a major source of beryl, producing 932 short tons during the year. Production came principally from Bikita, about 50 miles east of Fort Victoria; Douglas Lawrie, Ltd., was the largest individual operator. Significant quantities were also produced by G. H. Nolan and much smaller amounts by several other individuals. Beryl from Bikita is white or colorless, massive in occurrence, and easily overlooked by even the practiced eye.

Not until the fall of 1949, when an investigating team of the United States representatives seeking strategic minerals visited the tin-tantalite operations in the area, was the potential value of the Bikita pegmatites as a source of beryl recognized. Production of beryl on an important scale began immediately thereafter. Output to date has been almost entirely from surface rubble overlying the source pegmatites.

Search for beryl in Southern Rhodesia, inspired by the Bikita discovery, was reported to be the high light of 1950.[21] Small but significant output of beryl is realized from several small mines in the Salisbury district, notably the Augustus and Pope claims a few miles to the northeast, and from the nearby Hatfield granite quarries. Other productive areas are the Miami mica district 125 miles northwest of Salisbury and the Mtoko area 90 miles northeast of Salisbury.

Pegmatites in the Warmbad district of South-West Africa, near the Union of South Africa boundary, and in the Karibib-Usakos area east of Walvis Bay were the source of large tonnages of beryl in 1950, production establishing a new high record for the country. The Union of South Africa achieved the position of the world's second-largest producer of beryl in 1950, with an output of 844 metric tons. The productive area lies both south of and athwart the boundary with South-West Africa. Exportation of beryl from the Union is prohibited without permission of the Atomic Energy Board.

Asia.—Production of beryl was recently reported from the Kunar Valley, in Afghanistan; 7 tons of concentrates were exported to the United States in 1950.

[18] Foreign Commerce Weekly, vol. 38, No. 6, Feb. 6, 1950, p. 32.
[19] Metal Bulletin, No. 3493, May 19, 1950, p. 10.
[20] South African Mining and Engineering Journal, vol. 61, part 1, No. 2985, Apr. 29, 1950, pp. 273–275.
[21] Rhodesian Mining Review, vol. 16, No. 7, July 1951, pp. 19, 21.

The Indian Government announced in April 1950 that awards would be granted for discovery of domestic deposits of uranium and beryllium ore. In the instance of beryllium, the new deposit would have to be not less than 50 miles from any other such deposit already known to the Indian Atomic Energy Commission. A reward, up to 2,000 rupees, would be authorized for any such discovery capable of producing 100 tons of beryl or other beryllium minerals in equivalent amounts.[22] The export embargo placed on beryl in 1946 continued throughout 1950. Negotiations were reported in progress between the Government of India and representatives of beryl-consuming countries, such as the United States and France; objectives were manifold, including the desire to free available beryl for export, to reactivate beryl mining, and to arrange for possible construction of a jointly owned and operated beryllium oxide plant in India.

BORON

Production.—Domestic boron master-alloy output in 1950 totaled about 500,000 pounds, compared to about 300,000 in 1949. Shipments of producers in 1950 closely approximated production; in 1949 shipments amounted to about 200,000 pounds of master alloy. Companies producing boron alloys and related compositions are as follows: (for discussion of boron minerals, *see* Borates in the Salines—Miscellaneous chapter of this volume.)

Producer:	*Products (figures in parentheses indicate percent boron)*
American Electro Metal Corp., Yonkers, N. Y.	Miscellaneous metal borides; experimental.
F. W. Berk Co., Inc., Wood-Ridge, N. J.	Boron (82–86).
Cooper Metallurgical Associates, Cleveland, Ohio.	Boron (95–99); borides of Zr, Ta, W, Ti, Cr, Th, Mo, Cb, Al; cobalt boron (15); aluminum boron (5–30); lithium boron (20); copper boron (10); aluminum-titanium boron (1); boron nitride.
Electro Metallurgical Division, Union Carbide & Carbon Corp., Niagara Falls, N. Y.	Ferroboron (17.5), manganese boron (15–20), nickel boron, cobalt boron, Silcaz (0.55–0.75), calcium boride, boron carbide.
Metal Hydrides, Inc., Beverly, Mass.	Borohydrides of sodium, lithium, beryllium, and other elements.
Molybdenum Corp. of America, Washington, Pa.	Ferroboron (10–19), manganese boron (18), cobalt boron (10–16), chromium boron (12–18), calcium boride (30).
Niagara Falls Smelting & Refining Division, Continental-United Industries, Inc., Buffalo, N. Y.	Manganese–aluminum boron (2), nickel-aluminum boron.
Norton Co., Worcester, Mass	Boron carbide, boron, ferroboron (9).
Ohio Ferro-Alloys Co., Philo, Ohio	Borosil (3.5).
Titanium Alloy Mfg. Division, National Lead Co., Niagara Falls, N.Y.	Carbortam (1–2).
U. S. Atomic Energy Commission, Oak Ridge, Tenn.	Boron isotopes B–10 and B–11.
Vanadium Corp. of America, Bridgeville, Pa.	Grainal alloys (0.2–0.5).

[22] Mining Record, vol. 61, No. 24, June 15, 1950, p. 6.

Uses.—The most important use of boron in metallurgy is in the form of boron master alloys, which are added to medium- and high-carbon steels to confer depth hardenability and to intensify the effects of other ferro-alloy elements that may be present. On the basis of conferring hardenability to steel, boron is several hundred times as effective, per unit weight, as manganese, chromium, nickel, and molybdenum. In a 0.40-percent carbon steel, for example, 0.002 percent B will do the job of 0.30 percent Mn, 0.35 Mo, 0.50 Cr, or 2.00 Ni. As shortages of high-alloy steels became more severe late in 1950 with the onset of the Korean hostilities and threatened to become further accentuated, boron steels were given a prominent place in the melting schedules of several major steel producers. During World War II the NE (National Emergency) series of boron steels was developed to combat shortages of scarce ferro-alloy elements. At the close of hostilities, however, use of boron steel declined sharply as the more familiar high-alloy equivalents once more became abundant. Much has been learned about the preparation of boron-steel melts and the subsequent heat treatment of the resultant steels, so much so that uniform properties can now be assured. The boron steels now in commercial preparation or impending contain even smaller amounts of the scarce ferro-alloy elements than did the NE steels. Standard carburizing grades of all steels—for example, SAE–AISI 1320, 2515, 3120, 4118, 4620, 5120, 8620, and 8720—can be replaced by boron steel of composition: 0.17–0.23 C, 0.45–0.75 Mn, 0.15–0.35 Cr, 0.20–0.40 Ni, 0.08–0.15 Mo, 0.002 B. Standard full-hardening grades, such as SAE-AISI 1340, 4047, 4640, 5140, 8640, 8740, and 9440, are replaceable by boron steel of composition: 0.36–0.44 C, 0.70–1.00 Mn, 0.20–0.40 Ni, 0.15–0.35 Cr, 0.08–0.15 Mo, plus boron.

Boron is found in nature as the mineral borax, which is sufficiently abundant for any presently conceivable ferro-alloy requirements for the element. It has been estimated that about 2 million tons of boron steels have been used, all-told, since the late 1930's. Over 2 million tons may be produced in 1951 alone, and a sharp rise to as high as 20 million tons a year in 1952 has been indicated.

Important developments in boron-titanium,[23] boron-columbium, and boron-molybdenum [24] steels were recorded in 1949, and the use of medium-carbon boron steel in production was described.[25] Increased chill-depth and hardness are imparted to cast iron,[26] and a refined grain is given aluminum alloys. A few hundredths of 1 percent of boron is introduced into aluminum and copper intended for use as electrical conductors, the element effecting neutralization of impurities of certain high-resistance ferro-alloy metals that are sometimes present. Calcium boride and other additives are finding increased use for deoxidizing both ferrous and nonferrous melts.

---

[23] Steel, Recent Developments in Titanium and Titanium Alloys: Vol. 124, No. 26, June 27, 1949, pp. 58–61, 92, 94.

[24] Iron and Coal Trades Review (London), Boron in Low-Alloy Steels: Vol. 159, No. 4264, Dec. 2, 1949, pp. 1283–1288.

[25] Robbins, Fred J. Lawless, J. J., Use of Boron Steel in Production: Metal Prog., Vol. 57, No. 1, January 1950, pp. 81–89.

[26] Krynitsky, Alexander I., and Stern, Harry, Effect of Boron on the Structure and Some Physical Properties of Plain Cast Irons: Nat. Bureau of Standards Jour. Research, vol. 42, May 1949, pp. 465–479 (Research Paper 1987).

Boron carbide, the hardest commercial synthetic substance known, finds wide use in powder form as an abrasive and in fabricated wear-resistant parts, such as sand-blast nozzle linings and contact faces of high-precision dimension gages. The material is also used in molded form as dressing sticks for small grinding wheels, nozzle liners of jets employed in spray-drying starch and in debarking logs in the paper industry, pump-seal rings, and oil-well flow chokes. Experimental work on titanium-boron carbide molded parts has shown promise, the addition of titanium imparting toughness and improved resistance to spalling and chipping. During 1949 the Bureau of Mines continued to study boron carbide as a possible substitute for industrial diamonds in certain types of drilling equipment. Borides of certain ferro-alloy elements show much promise for high-temperature applications because of their near-metal properties, combined with unusual refractoriness and hardness.[27] A zirconium boride compound, developed in 1949 by the American Electro Metal Corp., Yonkers, N. Y., under an Office of Naval Research contract, survived the highest temperature blasts of any material tested to date that could be considered suitable for parts exposed to the temperatures attained in gas turbines and jet and rocket engines.[28] It was reported that the refractory borides would be of great value in the newly developed jet-aircraft industry of Sweden.[29]

Sodium and lithium borohydrides are powerful reducing agents in organic and inorganic synthesis at ordinary temperatures;[30] beryllium borohydride is the most efficient source of hydrogen known, 1 gram generating almost 5 liters of gas. Boron hydride continued to be of great interest because of its possible use as a high-energy fuel,[31] and patents were issued covering its preparation.[32] Boron trifluoride[33] and trichloride[34] are important raw materials in the organic chemical industry.

Prices.—During 1949 the prices of most boron-alloy additive agents remained unchanged from 1948; increases were noted in nearly every instance, however, by the end of 1950. Borosil declined in price from $6.25 to $4.25 per pound in August 1949, the new price continuing in effect through 1950.

[27] Norton, John T., Blumenthal, H., and Sindeband, S. J., Structure of Diborides of Titanium, Zirconium, Columbium, Tantalum and Vanadium: Jour. Metals, vol. 1, No. 10, October 1949, pp. 749–751.
Kiessling, Roland, The Borides of Tantalum: Acta chem. scand., vol. 3, 1949, pp. 603–615 (in English). Borides of Some Transition Elements: Acta chem. scand., vol. 4, No. 2, 1950, pp. 209–227 (in English).

[28] American Metal Market, New Metallic Compound Developed for High-Temperature Engines: Vol. 56, No. 155, Aug. 11, 1949, p. 1.

[29] American Metal Market, vol. 57, No. 229, Dec. 1, 1950, p. 1.

[30] Gibb, Thomas R. P., Jr., Hydrides: Jour. Chem. Education, vol. 25, No. 10, Oct. 1948, pp. 577–582.

[31] Chemical and Engineering News, Boron Hydrides: Vol. 27, No. 29, July 18, 1949, p. 2068.
Journal American Rocket Society, The Prospects of Jet-Reaction Flight: No. 77, 1949, pp. 59–74.
Zwicky, Fritz, Chemical Kinetics and Jet Propulsion: Chem. and Eng. News, vol. 28, No. 3, Jan. 16, 1950, p. 158.

[32] Hurd, Dallas T. (assigned to General Electric Co.), Boron Hydrides: U. S. Patent 2,469,879, May 10, 1949.
British Thomson-Houston Co., Ltd., Boron Hydrides: British Patents 623,760 and 623,761, May 23, 1949.

[33] Booth, Harold S., and Martin, Donald R., Boron Trifluoride and Its Derivatives: John Wiley & Sons, Inc., 1949, 315 pp.

[34] Hurd, Dallas T., Synthesis of Boron Trichloride: Jour. Am. Chem. Soc., vol. 71, No. 2, Feb. 1949, p. 746.

Technology.—Methods were described for producing elemental boron,[35] for improving the quality of boron carbide,[36] and incorporating the latter compound in ferro-alloys.[37]

Foreign Trade and World Review.—Boron products are produced in Canada, principally for United States companies. Blackwell's Metallurgical Works, Ltd., Liverpool, and Murex, Ltd., Rainham, Essex, United Kingdom, produce boron alloys of the ferrous and nonferrous metals.

CALCIUM

Production.—The Electro Metallurgical Division, Union Carbide & Carbon Corp., Sault Ste. Marie, Mich., and the New England Lime Co., Canaan, Conn., produce metallic calcium. Data on 1950 production are not available for publication. Output in previous years has amounted to a few tens of thousands of pounds a year. The Ethyl Corp. continued to develop plans throughout the year for producing calcium metal on a large scale in a granular, crystalline, highly reactive form suitable for use in chemical and refining operations. The metal would be recovered at Baton Rouge, La., from calcium-rich sludges that accumulate during electrolytic production of sodium metal.

Uses.—Calcium is used in metal-refining operations and, in some instances, as an alloy constituent of both ferrous and nonferrous metals. Calcium is reported to be an effective inoculant in the production of nodular iron.[38] Calcium-silicon and calcium-manganese-silicon are widely employed as deoxidizers and degasifiers in steel making and are sometimes used to confer finer grain, impact strength, and improved fluidity to cast steel.[39] About 1 to 6 pounds of calcium-silicon are ordinarily used per ton of steel. Calcium hydride is, perhaps, the most powerful desiccant known, a valuable reductant in both organic and inorganic reactions, and a notable condensation agent in organic synthesis. As a portable source of hydrogen, the calcium hydride gas generator has found extensive use.

Prices.—Calcium metal, ton lots, was quoted at $2.05 per pound throughout 1950.

Foreign Trade.—During 1950 imports of calcium metal were received from Canada (75,729 pounds) and Germany (27 pounds). Calcium-silicon was received from Canada (424,440 pounds) and France (67,200 pounds).

[35] Sowa, Frank J., Elemental Boron: U. S. Patent 2,465,989, April 5, 1949.
Kiessling, Roland, (Preparing Boron of High Purity): Acta chem. scand., vol. 2, No. 8, 1948, pp. 707–712.
[36] Chemical Age (London), Improved Boron Carbides: Vol. 60, No. 1547, Mar. 5, 1949, p. 360.
[37] Buchanan, Neville James, Boron Carbide Compound: U. S. Patent 2,479,097, Aug. 16, 1949.
[38] Canadian Metals, vol. 13, No. 10, Oct. 1950, p. 51.
[39] Sanderson, L., Metallurgical Developments and the Mining Engineer: Canadian Min. Jour. vol. 71, No. 1, January 1950, p. 71.

TABLE 5.—Calcium metal and calcium-silicon imported for consumption in the United States, 1937–50

[U. S. Department of Commerce]

Year	Calcium metal		Calcium-silicon	
	Pounds	Value	Pounds	Value
1937	23,767	$10,087	3,751,918	$205,173
1938	41,299	16,144	1,402,314	77,003
1939	41,718	17,758	3,972,571	225,312
1940	11,900	6,518	2,131,758	154,424
1941			111,994	8,337
1942			60,300	10,144
1943–44				
1945	17,086	15,845	164	22
1946			661,200	87,647
1947	354	675		
1948	796	2,483	429,488	52,378
1949	3,510	4,736	112,000	14,977
1950	75,756	66,407	491,646	11,479

Canada.—Dominion Magnesium Ltd., Haley's Station, Ontario, Canada, is the sole producer of calcium.

TABLE 6.—Canadian production of calcium metal, 1945–50 [1]

Year	Pounds	Year	Pounds
1945	29,543	1948	1,104,562
1946	53,548	1949	[2] 520,609
1947	723,461	1950	281,800

[1] No production before 1945.
[2] Revised.

CERIUM AND OTHER RARE-EARTH METALS

Prompted by swelling military and civilian requirements for rare-earth products, numerous companies were active in the United States during 1950 in both exploration for and development of monazite and bastnaesite deposits. In the instance of monazite, interest centered mainly along the western flank of the Idaho batholith in Idaho, where monazite-rich gold gravels have been known to exist for many years. Similar activity was reported in connection with certain alluvial deposits of western Montana. A small tonnage of monazite was recovered in 1950, as in several years previous, from the ilmenite-zircon-rutile operations of the Rutile Mining Co. of Florida near South Jacksonville, Fla. In the course of evaluating the thorium resources of the United States, the Bureau of Mines continued its detailed studies of monazite gravels, particularly in Idaho. In related work, centered mainly in the Southeastern States of Virginia, the Carolinas, and Georgia, the Geological Survey demonstrated the existence of alluvial monazite deposits over a much more extensive area than was previously known.

The deposit of bastnaesite and other rare-earth carbonate minerals northeast of Baker, Cal., which was discovered in 1949, attracted widespread attention in 1950. Mineralization was shown to exist beyond the original discovery locality, over an area extending several miles to the southeast. Late in 1950 a massive lode deposit of rare-earth carbonate minerals, about 20 acres in extent, was found near the southern extremity of the aforementioned area. Certain sections of the lode were estimated to assay up to 40 percent rare-earth oxides. Total rare-earth oxides contained in the lode, assuming continuation of surface values to a depth of 150 feet, was estimated to be of the order of 3 billion pounds.

Most of the mineralized area was acquired by the Molybdenum Corp. of America, and underground and surface exploration and development were begun. The exceptionally high rare-earth tenor of the newly discovered ore body, coupled with its size and amenability to low-cost surface operation, suggested strongly that, for the first time, a rare-earth ore might become available cheaply enough for large-scale exploitation.

In 1950 Shattuck Denn Mining Corp. made milling tests on about 100 tons of bastnaesite ore mined from a fluorspar property near Gallinas, N. Mex. The company reported that the cost of producing a salable grade of bastnaesite concentrate was prohibitive. Later in the year William Heim was reported to have operated on a small scale and successfully produced and shipped bastnaesite concentrates in conjunction with fluorspar operations.

The deposit of rare-earth minerals north of Sundance, Wyo., discovered in 1949, was core-drilled by the Bureau of Mines during the spring and summer of 1950. Large, low-grade reserves were found. No rare-earth mineral has yet been identified at this property, and a conclusion has been reached that the rare earths may be present in colloidal form associated with clay and iron oxides.

Production.—Data on output of mischmetal, ferrocerium, and other alloys of the rare-earth metals are not available for publication. Important domestic producers of the basic alloy, mischmetal, are Cerium Metals Corp., Niagara Falls, N. Y.; General Cerium Co., Edgewater, N. J.; and New Process Metals Co., Newark, N. J.

Consumption and Uses.—The master alloy of the rare-earth metals, mischmetal, is consumed domestically to the extent of a few hundred pounds a year at most. Principal uses are in production of ferrocerium for lighter flints, in preparation of rare-earth alloys of magnesium, and in production of certain special types of nodular cast iron. A comprehensive account of uses of the rare-earth metals and compounds was published.[40]

The marked effect of the rare-earth elements in conferring hot workability and toughness to steel was being closely scrutinized by several large steel producers. The improvement in workability results in substantial economies through better ingot-to-billet yields, less billet preparation, and improved hot-rolled strip surfaces. Indications were that use of rare earths would eliminate the cost of forging normally required for conferring toughness. The cumulative economies gained by employing the rare-earth elements, combined with the

[40] Kremers, Howard E., The Rare Earth Industry: Jour. Electrochem. Soc., vol. 96, No. 3, September 1949, pp. 152–157.

greatly increased abundance of their raw materials due to fortuitous recent discoveries, suggested that the rare earths might find use in the greater part of steels to be produced in future years.

Prices.—During 1950 mischmetal was quoted at $4.50 per pound, and ferrocerium cast into form for lighter flints was quoted at $8 per pound. Pure cerium metal (98 percent Ce) was offered at $25 per pound.

Foreign Trade.—Domestic receipts of mischmetal and ferrocerium in 1950 came exclusively from Canada; rare-earth compounds (chloride) imported originated entirely in Brazil.

Mischmetal and ferrocerium alloys were exported from the United States during 1950, in pounds, to the following countries: Germany, 34,382; Portugal, 15,200; Canada, 3,247; Belgium-Luxemburg, 2,204; Switzerland, 220; United Kingdom, 20. Data on exports of rare-earth compounds are not available.

World Review.—(*See* Monazite section, Minor Nonmetals chapter of this volume.)

TABLE 7.—Cerium and other rare-earth compounds imported for consumption in the United States, 1922–50

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value	Year	Pounds	Value
1922 [1]	57	$49	1928	100,826	$8,194	1944	106	$322
1923	44,799	4,670	1929	133,985	10,247	1945–48	----------	--------
1924	122,489	7,944	1930	88,120	13,453	1949	4,436	1,861
1925	22,093	7,022	1931	397	44	1950	177,161	54,801
1926	11,627	1,075	1932–42	(2)	(2)			
1927	86,858	6,130	1943	119	304			

[1] September–December only.
[2] Data not available.

TABLE 8.—United States foreign trade in mischmetal and ferrocerium alloys, 1924–50

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value
IMPORTS FOR CONSUMPTION					
1924	100	$208	1940	462	$1,611
1925	89	185	1941	20,190	90,948
1926	1	22	1942	11,573	65,549
1927	71	118	1943	5,720	27,589
1928	2,085	5,999	1944	20,240	91,203
1929	2,524	6,931	1945	33,080	151,963
1930	861	2,824	1946	15,660	80,276
1931–32	----------	------------	1947	665	3,708
1933	44	232	1948	1,600	12,380
1934–35	----------	------------	1949	220	880
1936	22	117	1950	1,000	3,200
1937–39	----------	------------			
EXPORTS					
1942 [1]	26,016	$84,739	1947	182,204	$1,053,936
1943	54,797	148,891	1948	55,133	323,582
1944	38,918	116,975	1949	70,009	262,922
1945	32,175	100,958	1950	55,273	212,752
1946	39,718	167,641			

[1] No data available for years before 1942.

CESIUM AND RUBIDIUM

Production.—De Rewal International Rare Metals Co., Philadelphia, Pa.; Fairmount Chemical Co., Newark, N. J., and A. D. Mackay, Inc., New York, N. Y., produce cesium and rubidium metals and compounds. Maywood Chemical Works, Maywood, N. J., produces cesium metal and its compounds and compounds of rubidium. General Electric Co. produces cesium metal at Scotia, N. Y. Foote Mineral Co., Philadelphia, Pa., makes cesium compounds. Harshaw Chemical Co., Cleveland, Ohio, proposes to grow optical crystals of cesium iodide and rubidium bromide, used for infrared spectrometry. The mineral pollucite, usually containing over 30 percent Cs_2O, has been the only commercial source of cesium to date;[41] rubidium is extracted from lepidolite, a lithium mica.

Uses.—Cesium is important as the active component in some types of photoelectric cells, in cesium-vapor lamps used by the Armed Forces for infrared signaling, and in the newly developed cesium-vapor rectifier.[42] A method for producing cesium compounds, adaptable to large-scale operation and based upon the preferential solubility of cesium bromide in liquid bromine, was patented.[43] In the fission of U–235, various long-lived radioisotopes of cesium are among the more abundant end products, one such, Cs–135, having a half-life exceeding 600,000 years.[44] As a consequence, much attention has been devoted to the chemistry of cesium by the Atomic Energy Commission in developing processes for separation and disposal of atomic pile waste products.

Rubidium, in general, has the same uses as cesium. Although much more abundant in nature than cesium, unlike the latter it forms no known minerals in which it is an essential or major constituent. The rubidium content of commercial potassium chloride recovered from subterranean Michigan brines is approximately 0.05 percent. According to estimates, about 1 ton of elemental rubidium per year might be obtained from such brines. The naturally occurring radioisotope Rb–87 has a half-life computed to be about 600,000,000 years.[45] A method for determining the age of rocks is based upon observing the ratio of Rb–87 content to that of the stable strontium end product.[46]

[41] Hackspill, Louis, and Thomas, Georges, (Direct Preparation of Metallic Cesium from Swedish Pollucite): Compt. rend., vol. 230, No. 12, Mar. 20, 1950, pp. 1119–1121.
[42] Hull, A. W., Burger, E. E., Turrentine, R. E., The Cesium Rectifier: Phys. Rev., vol. 73, No. 10, May 15, 1948, p. 1228.
[43] Stenger, Vernon A. (assigned to Dow Chemical Co.), Cesium Bromide Separation: U. S. Patent 2,481,-455, Sept. 6, 1949.
[44] Inghram, Mark G., Hess, David C., Jr., and Reynolds, John H., On the Relative Yields of Fission Cesium Isotopes: Phys. Rev., vol. 76, No. 11, Dec. 1, 1949, pp. 1717–1718.
[45] Kemmerich, Maria (Half-Life of Rubidium): Ztschr. Physik, vol. 126, 1949, pp. 399–409.
[46] Ahrens, L. H., The Geochemistry of Radiogenic Strontium: Mineralog. Mag., vol. 28, No. 200, March 1948, pp. 277–295.

COLUMBIUM (NIOBIUM) AND TANTALUM

Mine Production.—About 2,700 pounds of tantalite-columbite were produced from domestic sources during 1950. Individuals and companies reporting output were George C. Bland, Walter Clifford, Francis Michaud, and Mineral Mills, Inc., Custer, S. Dak.; Black Hills Keystone Corp., Keystone, S. Dak.; Ralph R. Hermstain, Texas City, Colo.; and Beryllium Mining Co., Inc., Ohio City, Colo. Domestic mine shipments for 1950 totaled 1,000 pounds (*see* table 15). The occurrence of tantalum in the famous Harding mine near Dixon, N. Mex., was described.[47]

Domestic Refiners.—Essentially all concentrates of tantalum and columbium minerals of domestic or foreign origin are consumed by two companies: Fansteel Metallurgical Corp., North Chicago, Ill. (miscellaneous tantalum and columbium products), and the Electro Metallurgical Division of Union Carbide & Carbon Corp., Niagara Falls, N. Y. (ferrocolumbium and ferrocolumbium-tantalum).

Consumption and Uses.—Military requirements for columbium in the swiftly expanding jet-engine program so far transcended any known or hoped-for supply that drastic measures had to be taken for allocation, conservation, and substitution. Accordingly, the National Production Authority issued Order M–3 on October 20, 1950, stipulating that production, distribution, and use of ferrocolumbium and ferrocolumbium-tantalum be limited to "DO" defense rated orders which are reserved under the NPA priorities system to procurement by the Department of Defense and the Atomic Energy Commission. The order provided further that use of ferrocolumbium-bearing steels be prohibited wherever ferrocolumbium-tantalum steels might be substituted and that use of either type of steel be prohibited where any other substitute was available.

The function of columbium and columbium-tantalum in alloy steels varies according to the type of alloy in which it is used. The presence of one or both of these elements is required in austenitic stainless steels (Type 347, 18–8) as a carbide stabilizer, to inhibit intergranular corrosion in the temperature range 800°–1,600° F. Columbium and tantalum confer high-temperature strength and creep resistance to the important low-iron superduty alloys used for jet-engine parts exposed to extreme heat and operating strain. Improved ductility and reduction in tendency to air-harden are imparted to plain chromium stainless steels through addition of columbium or tantalum.

[47] Montgomery, Arthur, Geochemistry of Tantalum in the Harding Pegmatite: Am. Mineral., vol. 35, Nos. 9 and 10, 1950, pp. 853–66.

TABLE 9.—Approximate composition of some alloys containing columbium and tantalum

Type	Component elements (percent of total weight)											
	Fe	Ni	Cr	Co	Cb	Ta	Mo	W	C	Ti	Other	Use
S-816	3	20	20	44	4	----	4	4	0.4	----	0.6	Parts for jet engines and gas turbines or other applications involving high-temperature operation.
S-590	25	20	20	20	4	----	4	4	.4	----	2.6	Do.
MIT-N2	21	30	20	20	----	2.0	3	2.2	1.0	----	0.8	Do.
I-1360	4.5	70	10	----	2	----	5	----	.10	----	6.0–Al, 0.5–Be, 1.9–other.	Do.
N-155	.32	20	20	20	1.0	----	3	2	.3	----	0.11–N_2, 33.27–other.	Do.
Inconel-X	7	73	15	----	1.0	----	----	----	.05	2.5	1.45	Do.
EME	63	12	19	----	1.2	----	----	3.2	.1	----	0.15–N_2, 1.35–other.	Do.
19-9-DL	67	9	19	----	.3	----	1.2	1.2	.3	.3	1.7	Do.
347	67	11.5	18.5	----	.85	----	----	----	.08	----	1.25–Mn, 0.60–Si, 0.02–P, 0.10–S, 0.10–other.	Same as above; also in many industrial applications where high temperatures and/or corrosion may be encountered.
Ferrocolumbium.	40	----	----	----	55	5	----	----	----	----	----	Master alloy for making 347 and other alloys containing columbium.
Ferrocolumbium-tantalum.	40	----	----	----	40	20	----	----	----	----	----	Master alloy for making 347 Cb-Ta and other alloys containing columbium and tantalum.

Columbium in the form of metal or compounds has only slight commercial use. Conversely, tantalum is extensively employed in metal form because of its desirable combination of easy formability and resistance to oxidation and other types of chemical corrosion. Tantalum is employed in chemical-processing equipment, vacuum-tube parts, surgical sutures and repair items, and electrolytic condensers (in powder form). As a carbide, tantalum finds special application in cast alloys, in cutting tools, and in shell-nosing dies. Tantalum oxide, combined with other elemental oxides, such as those of lanthanum and tungsten, forms a lens composition used in aerial photography. Another important use of the oxide, highly critical during World War II, is as a catalyst (2 percent Ta_2O_5–98 percent SiO_2) for efficient conversion of acetaldehyde-ethyl alcohol to butadiene, a basic raw material for synthetic rubber production.[48]

Prices.—Domestic quotations on columbite concentrates are not available. The Metal Bulletin (London) quotations for columbite ore, 50–55 percent combined columbium-tantalum oxides, per unit, c. i. f., showed an unbroken rise throughout 1950 as follows: January 6, 110s.–115s.; April 14, 117s.6d.–122s.6d; June 30, 120s.–122s.6d; July 7, 122s.6d.–127s.6d.; July 28, 130s.–135s.; September 1, 130s.–150s.; December 1, 170s.–180s.; December 15, 250s.–260s. The unparalleled

[48] Corson, B. B., Jones, H. E., Walling, E. E., Hinckley, J. A., and Stahly, E. E., Butadiene from Ethyl Alcohol: Ind. Eng. Chem., vol. 42, No. 2, February 1950, pp. 359–373.

demand for columbite, principally in military aircraft, was the principal factor in driving prices to the highest level ever attained, the rise being unbroken over the 3-year period 1948–50. In 1948 prices increased from 65s. to 75s.; in 1949, from 75s. to 115s.; and in 1950, from 115s. to 260s. Tantalum ore continued to be quoted nominally at \$2–\$2.50 per pound Ta_2O_5 contained, 60 percent Ta_2O_5 minimum, price varying with impurities.

Reflecting the increased price of columbite ore, ferrocolumbium alloy, 50–60 percent Cb, rose in price from \$2.90 per pound contained Cb, delivered, in January, to \$3.50 in March and to \$4.90 in November. Ferrocolumbium-tantalum (40 percent Cb, 20 percent Ta) was quoted for the first time in March at \$2.67 per pound contained Cb plus Ta, delivered, an increase to \$3.75 per pound being noted in November. Standard columbium-stabilized stainless steel, type 347, was quoted in January at 20 cents per pound, f. o. b. producing point, the price rising to 21 cents in July and to 21½ cents in December. Prices on columbium metal have remained unchanged since 1948, being quoted at \$280 per kilogram for rod and \$250 for sheet. Similarly, tantalum rod was quoted at \$160.60 and sheet at \$143.

Foreign Trade.—An increase in United States imports of columbite over the previous year was realized in 1950. The increase, however, was only apparent, being in terms of gross weight of concentrates rather than effective columbium content. This situation was brought about because declining receipts of columbium-rich Nigerian concentrates were counterbalanced by a sharply increased intake of columbium-poor concentrates from the Belgian Congo. Increased diversion of Nigerian columbite to consumers in the United Kingdom and continental countries contributed significantly to the decline in United States receipts from West Africa. Alloys of columbium, principally ferrocolumbium, amounting to 268,424 pounds, valued at \$92,280, were imported from the United Kingdom during 1950.

Export of columbium ore comprised 109 pounds to Germany. No tantalum ore was exported. Columbium metal and alloys were exported amounting to 17 pounds, valued at \$1,231; tantalum metal and alloys totaling 1,282 pounds and valued at \$61,322 were shipped abroad.

TABLE 10.—Columbite imported for consumption in the United States, 1934–50, in pounds

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value
1934	(1)	(1)	1943	2,382,050	$844,544
1935	1,184,315	$97,737	1944	3,684,530	1,196,899
1936	996,000	257,666	1945	4,277,152	1,312,346
1937	922,654	306,086	1946	2,426,246	742,804
1938	645,141	228,078	1947	2,821,634	857,550
1939	109,132	37,062	1948	1,973,728	658,950
1940	595,220	210,526	1949	1,557,479	561,945
1941	1,440,455	504,537	1950	1,726,717	752,926
1942	1,762,355	608,917			

[1] "Substantial" shipments reported from Nigeria; quantity and value not available.

TABLE 11.—Columbite imported for consumption in the United States, 1941–50, by countries, in pounds

[U. S. Department of Commerce]

Country	1941	1942	1943	1944	1945
Belgian Congo		36,422		1,373	
Belgium-Luxembourg [1]					
Bolivia					1,034
Brazil	2,229	1,133			
India			21,600	1,470	
Japan [1]					
Mozambique					22,046
Nigeria	1,435,312	1,724,800	2,350,329	3,658,084	4,220,691
Uganda [2]			3,111	23,603	33,381
Other	[3] 2,914		[4] 7,010		
Total	1,440,455	1,762,355	2,382,050	3,684,530	4,277,152

Country	1946	1947	1948	1949	1950
Belgian Congo		2,734	113,813	198,585	400,868
Belgium-Luxembourg [1]			27,125		
Bolivia	[5] 6,834				
Brazil	7,717		6,926	8,568	10,981
India					
Japan [1]					31,835
Mozambique				1,200	
Nigeria	2,411,695	2,818,900	1,822,843	1,349,126	1,280,930
Uganda [2]					
Other			[6] 3,021		[7] 2,103
Total	2,426,246	2,821,634	1,973,728	1,557,479	1,726,717

[1] Presumably country of transshipment rather than original source.
[2] Classified by U. S. Department of Commerce as British East Africa.
[3] Argentina.
[4] Argentina, 2,685 pounds; Union of South Africa, 4,325 pounds.
[5] Classified by U. S. Department of Commerce as from Chile, which is believed to be the country of transshipment only.
[6] Union of South Africa, 1,821 pounds; United Kingdom (presumably country of transshipment), 1,200 pounds.
[7] Portugal.

TABLE 12.—Tantalite imported for consumption in the United States, 1917–50, in pounds

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value
1917–19			1935	6, 083	$9, 342
1920	[1] 60	$54	1936	20, 758	30, 751
1921	[2] 8, 014	2, 115	1937	20, 897	40, 742
1922			1938	41, 706	80, 092
1923	5, 600	3, 031	1939	56, 561	82, 990
1924			1940	490, 460	258, 514
1925	5, 022	1, 347	1941	403, 464	188, 936
1926	350	149	1942	567, 494	467, 418
1927	15, 119	20, 012	1943	643, 080	724, 066
1928			1944	837, 130	699, 473
1929	15, 250	19, 418	1945	630, 092	453, 141
1930	8, 474	7, 036	1946	363, 553	302, 397
1931	6, 288	6, 289	1947	418, 753	386, 934
1932	36, 131	51, 033	1948	127, 688	82, 799
1933	14, 257	20, 530	1949	136, 664	237, 292
1934	24, 630	35, 441	1950	328, 728	244, 205

[1] Classified as "ferro-alloys (tantalum)."
[2] Includes 1,229 pounds classified as "ferro-alloys (tantalum)" and 6,785 pounds classified as "steel-hardening ores (tantalum)."

TABLE 13.—Tantalite imported for consumption in the United States, 1941–50, by countries, in pounds

[U. S. Department of Commerce]

Country	1941	1942	1943	1944	1945
Argentina			2, 420	8, 233	
Australia	29, 574	[1] 1, 470	10, 708	9, 315	21, 125
Belgian Congo	146, 904	309, 843	157, 073	332, 312	485, 986
Belgium-Luxembourg [2]					
Brazil	161, 996	237, 210	416, 874	440, 460	68, 229
India			1, 805	2, 442	
Japan [2]					
Mozambique			3, 567	4, 751	
Netherlands [2]					
Nigeria			5, 757	18, 116	31, 410
Southern Rhodesia	64, 773	18, 971	40, 481	12, 794	9, 967
Uganda [3]			3, 063	7, 277	11, 348
Union of South Africa	217		1, 332	632	2, 027
Other				[4] 798	
Total	403, 464	567, 494	643, 080	837, 130	630, 092

Country	1946	1947	1948	1949	1950
Argentina			1, 074		
Australia	500	9, 468			
Belgian Congo	263, 097	311, 526	93, 939	38, 086	211, 433
Belgium-Luxembourg [2]		3, 199			85, 683
Brazil	98, 072	71, 634	9, 202	63, 478	13, 378
India					
Japan [2]					10, 691
Mozambique					
Netherlands [2]				29, 500	
Nigeria		7, 998	14, 559	4, 480	7, 543
Southern Rhodesia		14, 928	8, 914		
Uganda [3]					
Union of South Africa	1, 884			1, 120	
Other					
Total	363, 553	418, 753	127, 688	136, 664	328, 728

[1] Classified by U. S. Department of Commerce as from New Zealand, which has no recorded production.
[2] Presumably country of transshipment rather than original source.
[3] Classified by U. S. Department of Commerce as British East Africa.
[4] Anglo-Egyptian Sudan, 98 pounds; Canada, 700 pounds.

WORLD REVIEW

Belgian Congo.—Long-range development of the tin-tantalite-columbite pegmatites athwart the border of the Congo and Ruanda-Urundi promised an eventual large increase in production from this area. The principal operation is the Geomines concern. Financial support to the expansion program is being supplied by the Economic Cooperation Administration.

British Guiana.—Columbite is known to exist in the basins of the Rumong-Rumong and Morabisi Rivers about 100 airline miles southwest of Georgetown. According to estimates the Morabisi area contains 1,000,000 cubic yards of material averaging 2 pounds of concentrate (assaying 44.3 percent Cb_2O_5 and 21.1 Ta_2O_5) per yard.[49]

Nigeria.—Columbite is produced in the Provinces of Bauchi, Benue, Kano, Niger, Plateau, and Zaria. Largest producers are Amalgamated Tin Mines of Nigeria, Ltd.; Jantar Nigeria Co. Ltd.; Bisichi Tin Co. (Nigeria), Ltd.; and Minerals Research Syndicate, Ltd. Reserves of columbite in Nigeria, as of March 31, 1950, were estimated at 7,000 long tons proved and 2,276 indicated.[50] Geological study indicated columbite to be widespread in the Younger granite, possibly as a primary accessory constituent. This granite was believed to constitute the primary source of the Jos Plateau columbite, as it occurs at the headwaters of the Forum River, above the extensive Jantar deposit, said to be the largest in the world.[51]

Columbite is generally recovered in Nigeria as a secondary item in the production of tin concentrates. According to reports, however, Jantar Nigeria Co., Ltd., and Minerals Research Syndicate, Ltd., operate certain areas primarily for columbite.[52] Despite unlimited consumer demand and all-time high prices, official sources indicated an unpromising long-term outlook because of dwindling tin reserves.

Norway.—European press reports indicated active support of the Economic Cooperation Administration in developing a large deposit of columbium minerals (koppite and columbite) occurring in limestone southwest of Oslo.

Swaziland.—Columbite-bearing gravels occur in the Forbes Reef area. Investigation of the deposits was continuing.[53]

Uganda.—The columbium mineral, pyrochlore, occurs in significant quantity in calcareous rocks of the Tororo neighborhood, Eastern Province.[54] Recovery of the pyrochlore is reportedly contingent upon development of a cement plant on the northeast slope of Sukulu Hill, about 3 miles from Tororo station. In the course of mining limestone for cement production, the heavy minerals, including pyrochlore, would be separated for special treatment. The Geological Survey of Uganda reported that special investigations of columbite-tantalite deposits were being made to determine operating costs.

United Kingdom.—The report of Murex, Ltd., for the year ended April 30, 1950, stated that new facilities had been installed for producing tantalum metal.

---

[49] Bureau of Mines, Mineral Trade Notes, vol. 31, No. 5, November 1950, pp. 7–8.
[50] Mines Department (Nigeria), Annual Report for the Period 1st January 1949 to 31st March 1950: 1951, p. 12.
[51] Mackay, R. A., Greenwood, R., and Rockingham, J. E., The Geology of the Plateau Tinfields—Resurvey 1945–48: Geol. Survey Nigeria, Bull. 19, 1949, pp. 14–15.
[52] Geological Survey Department, Nigeria, Annual Report for the Year 1949–50: Kaduna, Nigeria, 1951
[53] Colonial Geology and Mineral Resources, vol. 1, No. 4, 1950, p. 339.
[54] Colonial Geology and Mineral Resources, vol. 1, No. 3, 1950, p. 255.

TABLE 14.—World production of columbite concentrates, 1931–50, in pounds [1]

Year	Argentina [1] [2]	Belgian Congo [1]	Brazil [3]	French Equatorial Africa [1]	India [4]	Mozambique [1]	Nigeria	Uganda	Union of South Africa	United States (mine shipments)
1931	(5)	(5)	(5)	--------	112	(5)	--------	(5)	(5)	(6)
1932	(5)	(5)	(5)	--------	(5)	(5)	--------	(5)	(5)	(6)
1933	(5)	(5)	(5)	--------	(5)	(5)	6, 720	(5)	(5)	(6)
1934	(5)	97, 020	(5)	--------	(5)	(5)	35, 840	(5)	(5)	(6)
1935	(5)	141, 120	(5)	--------	(5)	(5)	150, 080	(5)	19, 572	(6)
1936	(5)	125, 685	(5)	--------	2, 262	(5)	759, 360	[2] 41, 418	13, 612	(6)
1937	(5)	207, 270	23, 770	--------	1, 254	(5)	1, 606, 080	[2] 61, 958	1, 604	(6)
1938	--------	337, 365	28, 477	--------	(5)	(5)	1, 191, 680	(7)	1, 302	(6)
1939	--------	361, 620	76, 769	--------	(5)	(5)	965, 440	(7)	954	(6)
1940	--------	590, 940	33, 662	--------	(5)	(5)	887, 040	(7)	186	(6)
1941	4, 400	458, 640	7, 981	--------	(5)	17, 600	900, 480	--------	--------	--------
1942	6, 600	280, 035	1, 074	--------	(5)	11, 000	1, 937, 600	--------	--------	--------
1943	1, 800	332, 955	37, 500	--------	[8] 21, 600	11, 000	1, 796, 480	(7)	2, 440	5, 771
1944	200	648, 270	116, 871	--------	[8] 1, 470	11, 000	4, 603, 200	[2] 12, 320	6, 312	3, 208
1945	1, 000	436, 590	--------	10, 584	(5)	4, 400	3, 519, 040	[9] 13, 194	776	1, 149
1946	(5)	370, 440	15, 435	2, 200	(5)	440	3, 472, 000	[9] 4, 883	[10] 4, 000	--------
1947	(5)	[11] 348, 390	--------	2, 200	(5)	--------	2, 880, 640	[9] 2, 800	--------	--------
1948	(5)	[11] 319, 725	4, 760	3, 454	(5)	--------	2, 455, 040	[9] 2, 285	--------	100
1949	(5)	[11] 255, 780	15, 396	12, 987	(5)	550	989, 120	5, 578	(5)	(6)
1950	(5)	[11] 297, 675	26, 653	3, 660	(5)	7, 700	1, 935, 360	11, 200	[10] 4, 000	(6)

[1] Concentrates produced in Argentina, Belgian Congo, French Equatorial Africa and Mozambique are frequently termed "columbite-tantalite," this designation being applied because, in general, their composition ($Cb_2O_5+Ta_2O_5$) lies in an intermediate range, neither Cb_2O_5 nor Ta_2O_5 being strongly predominant. In tabulating production of columbite and tantalite, all output designated "columbite-tantalite" has arbitrarily been placed in the columbite table. Concentrates imported into the United States are designated specifically as either columbite or tantalite, this classification sometimes being arbitrary; therefore discrepancies between figures in the columbite and tantalite production tables and United States import tables for these minerals should be viewed accordingly. In addition to countries shown, production of columbite in Madagascar has been reported in 1921, 4,410 pounds; 1922, 660; 1945, 22. There is believed to be current production in Madagascar; however, data are not available. Bolivia reportedly produced 1,034 pounds in 1945 and 6,834 in 1946. Production in Malaya during the Japanese occupation was estimated at about 10,000 pounds.

[2] Estimated average Cb_2O_5 content of concentrates.

[3] Exports.

[4] Production of fergusonite in 1913, 100 pounds and 1914, 4,300 pounds.

[5] Data not available.

[6] Columbite and tantalite production in the United States not always differentiated; *see* table 15, on tantalite.

[7] Tin-columbite-tantalite concentrates, columbite-tantalite content unspecified, produced as follows: 1938, 20,066 pounds; 1939, 8,014 pounds; 1940, 1,546 pounds; 1943, 15,700 pounds.

[8] United States imports.

[9] Contained in 17,687 pounds mixed (presumably tin-columbite-tantalite) concentrates in 1945; in 7,706 pounds in 1946; in 3,651 pounds in 1947; in 3,203 pounds in 1948.

[10] Sales and exports.

[11] In addition, tin-columbite-tantalite concentrates were produced as follows: 1947, 597,555 pounds, columbite-tantalite content unspecified; 1948, 1,148,050 pounds, columbite-tantalite content 13 percent; 1949, 1,944,810 pounds, columbite-tantalite content 10 percent; 1950, 2,432,115 pounds, columbite-tantalite content unspecified.

TABLE 15.—World production of tantalite concentrates 1901–50, in pounds [1]

Year	Australia [2]	United States [3] (mine shipments)	Year	Australia [2]	United States [3] (mine shipments)	Year	Australia [2]	United States [3] (mine shipments)
1901–03	(4)	(4)	1917	28,000	----------	1926 [5]	43,568	2,100
1904	(4)	(6)	1918	----------	4,500	1927 [7]	34,384	1,100
1905	164,170	(6)	1919	----------	300	1928	20,362	34,899
1906	----------	(6)	1920	----------	4,000	1929	28,090	22,117
1907	----------	(6)	1921	----------	3,400	1930	6,048	5,100
1908	2,912	----------	1922	----------	600	1931	3,181	700
1909	----------	(6)	1923	----------	1,350	1932 [5]	21,885	390
1910	----------	(6)	1924	----------	1,197	1933	12,880	300
1911	----------	(6)	1925	14,000	----------	1934 [8]	1,971	2,425
1912–16	----------	----------						

Year	Australia [2]	Brazil [9]	Nigeria	Southern Rhodesia	South-West Africa	Uganda [10]	United States [3] (mine shipments)
1935	33,981	(4)	----------	2,000	13,448	(4)	7,681
1936	33,555	(4)	----------	(4)	[11] 6,720	----------	----------
1937	40,320	(4)	----------	(4)	[11] 6,384	----------	16,307
1938	44,979	56,165	----------	15,900	[11] 4,861	----------	36,189
1939	18,547	53,508	----------	10,260	4,166	----------	340
1940	14,157	59,781	----------	16,000	[11] 22	----------	----------
1941	----------	199,913	----------	36,000	[11] 228	----------	250
1942	1,904	250,178	----------	28,000	[11] 40	----------	200
1943	25,178	398,631	4,500	14,000	[11] 2	----------	[12] 9,411
1944	24,192	443,129	27,082	12,000	(11)	[9, 13] 9,520	[12] 7,204
1945	1,053	66,139	29,792	14,740	----------	[9, 14] 670	[12] 5,500
1946	806	98,035	2,890	16,900	----------	----------	[12] 3,475
1947	1,411	71,680	8,310	27,300	493	----------	[12] 3,259
1948	12,023	9,183	8,243	16,120	17	----------	500
1949	3,502	91,047	4,980	10,840	5,374	----------	[15] 1,020
1950	16,536	18,700	2,240	1,700	12,570	----------	[15] 1,000

[1] *See* table 14, footnote 1. United States imports show 98 pounds of tantalite received from Anglo-Egyptian Sudan in 1944; 700 from Canada in 1944; and 1,805 and 2,442 pounds from India in 1943 and 1944, respectively.
[2] Estimated average Ta_2O_5 content of concentrates.
[3] Prior to 1941, concentrates were designated as "tantalite-columbite"; however, in composition Ta_2O_5 was strongly predominant over Cb_2O_5, therefore these concentrates have been tabulated in this table, rather than table 14, on columbite. From 1941–48, inclusive, tantalite and columbite are differentiated.
[4] Data not available.
[5] Also Southern Rhodesia, 2,000 pounds.
[6] Small production reported, quantity unspecified.
[7] Also South-West Africa 672 pounds, Uganda 60,480 pounds.
[8] Also South-West Africa 661 pounds.
[9] Exports.
[10] *See also* table 14, on columbite.
[11] In addition, tin-tantalite concentrates, unspecified tantalite content, produced as follows: 1936, 1,165 pounds; 1937, 1,322 pounds; 1938, 1,366 pounds; 1940, 1,456 pounds; 1941, 370 pounds; 1942, 161 pounds; 1943, 560 pounds; 1944, 2,000 pounds.
[12] Principally microlite.
[13] Includes 6,720 pounds of bismutotantalite.
[14] Bismutotantalite.
[15] Tantalite-columbite.

GALLIUM

Production.—Gallium metal was produced in 1950 by the Aluminum Ore Co., East St. Louis, Ill., and the Anaconda Copper Mining Co., Great Falls, Mont. Eagle-Picher Lead Co., Joplin, Mo., a significant producer in previous years, reported no output in 1950. Gallium oxide and a small quantity of metal were produced by Saratoga Laboratories, Inc., Saratoga Springs, N. Y.

Uses.—Except for an exceedingly small intermittent consumption as a component in direct-reading high-temperature thermometers, no important specific uses for gallium have been developed to date.

Research has been directed toward developing applications, and wide publicity has been given to the element to arouse further interest in its possibilities.

Prices.—Quotations on gallium metal in 1950, 99.9 percent pure, declined below 1949, the metal being offered at $4.50 per gram in lots of less than 100 grams; $3.50 per gram, for 100 to 999 grams; and $3.00 per gram, for 1,000 to 2,499 grams. Metal of 99.99 percent purity commanded a premium of $0.25 per gram. For experimental use in schools and research institutions, the standard grade was quoted at $3 per gram in lots of more than 5 grams.

World Review.—Gallium and germanium are extracted commercially from flue dust in England, the development having been pioneered by the Chemical Research Laboratory.[55] Coals of Northumberland, Durham, and Yorkshire are richest in gallium and germanium, although nearly all British coals are reported abnormally rich in the elements. The National Physical Laboratory has devoted much attention to a study of the electrical properties of gallium. (*See* Germanium review, this chapter, for further data on gallium.)

GERMANIUM

Production.—During 1950 the Eagle-Picher Co., Joplin, Mo., continued its unbroken dominance in the production of germanium and its compounds. Small but significant quantities of germanium dioxide were produced by the American Steel & Wire Co. (subsidiary of U. S. Steel Corp.), Donora, Pa., and by Saratoga Laboratories, Inc., Saratoga Springs, N. Y.

The U. S. Geological Survey, in the course of its exhaustive study of trace elements in ash of American coals, reported an occurrence of germanium-rich lignite (Cupressinoxylon wardi) in the Patuxent formation in the District of Columbia and environs. Germanium content of the ash from the lignite ranged up to 6 percent, with many samples containing 3 to 5 percent; gallium ranged between 0.003 and 0.2 percent. The ash analyzed represented between 2 to 9 percent by weight of the lignite from which it was derived.[56]

Consumption and Uses.—Consumer interest was keen in 1950; and apparent consumption, based on producers' shipments, reached a new high. The principal use of germanium to date has been in metallic form in the rectification of high-frequency electrical currents in radar and television circuits. The rectifier consists of a germanium-metal wafer, measuring about 3 by 3 by 0.6 mm., in contact with a pointed tungsten wire. Current will flow readily from the tungsten wire to the germanium, but a strong resistance prevails to flow in the reverse direction. Germanium that functions in this way is known as N-type and will, if pure enough, withstand back-voltages of 150 volts or more before any significant reverse flow of current develops. When certain impurities, such as arsenic, are present in germanium, P-type metal is formed which possesses rectifying properties. The impressed current flows, however, from the metal wafer to the tungsten point, directly

[55] Mining Journal (London), Two New Metals for British Industry: Vol. 234, No. 5982, pp. 367–368.
[56] Stadnichenko, Taisia, Murata, K. J., and Axelrod, J. M., Germaniferous Lignite from the District of Columbia and Vicinity: Science, vol. 112, No. 2900, July 28, 1950, p. 109.

contrary to the N-type. N-type germanium is generally desired for commercial use. Arsenic content of not more than about 0.5 part per million is required.[57]

Probably the largest potential use for germanium is in the transistor, a three-element electronic device constructed similar to the diode but possessing two tungsten contact points instead of one. A small positive voltage is impressed upon one contact and a large negative voltage on the other. A small change in voltage at the positive contact causes a much greater change in the current flow across the negative contact, making the transistor behave as an amplifier similar to a three-element vacuum tube. Unlike the latter, however, no filament current is required. The exceedingly small size of the transistor opens up new vistas for the design engineer wherever space saving is imperative, as in hearing aids and electronic-control devices in military equipment, such as guided missiles and proximity fuses.

A new type of photoelectric cell, of which germanium is an essential part, was announced in 1950 by the Bell Telephone Laboratories. The new device, called the "phototransistor," is similar in construction to the rectifying diode, described above, being composed of a tiny germanium disk with a tungsten contact wire impressed upon it. Light striking the germanium wafer on the side opposite the wire varies the current flow in the wire, making a device similar in function to a photoelectric cell. The new type of electric eye approximates a small-caliber rifle cartridge in size.[58]

The General Electric Co. reopened its Clyde, N. Y., plant late in 1950 for the manufacture of germanium products, principally diodes. Nearly a million diodes were reported used in television receivers in 1950. Company officials predicted that over 3 million would be used in 1951 for television and radio and over 2 million for industrial and military applications.[59]

Technology.—The Industrial Research Division of Washington State College, Pullman, Wash., was reported active in research to improve the technique for removing germanium from electrolytic zinc solutions. As little as 1 part per million of germanium, when present in such solutions, can cause difficulty in the production of electrolytic zinc.[60] Methods for extracting germanium and gallium from flue dust were developed,[61] and patents were issued relating to the preparation of germanium alloys for use in rectifiers, transistors, and photosensitive cells.[62] Important papers were published discussing the physical properties of germanium metal and metallurgical problems connected with its preparation in different physical states.[63]

[57] Metal Industry, Germanium: Vol. 78, No. 8, Feb. 23, 1951, pp. 151, 153.
[58] Science News Letter, Photo-Electric Eye Heart: Vol. 57, No. 16, Apr. 22, 1950, p. 252.
[59] Chemical and Engineering News, vol. 28, No. 46, Nov. 13, 1950, p. 3984.
[60] Engineering and Mining Journal, vol. 151, No. 11, November 1950, p. 138.
[61] Reynolds, F. M., Gallium and Germanium Extraction from Flue Dust: Chemical Products, vol. 13, No. 4, March 1950, pp. 152–153.
[62] Whaley, R. M. (assigned to Purdue Research Foundation), Alloys of Germanium and Method of Making Same: U. S. Patent 2,505,633, Apr. 25, 1950.
Benzer, S. (assigned to Purdue Research Foundation), Electrical Device with Germanium Alloys: U. S. Patent 2,504,627, Apr. 18, 1950.
Lark-Horovitz, Karl, and Whaley, Randall M. (assigned to Purdue Research Foundation), Germanium Alloy Rectifiers: U. S. Patent 2,514,879, July 11, 1950.
[63] Schumaker, Earle E., Metallurgy Behind the Decimal Point: Jour. Metals, vol. 188, No. 9, September 1950, Trans., pp. 1097–1110.
Theurer, H. C. and Scaff, J. H., Effect of Heat Treatment on the Electrical Properties of Germanium: Jour. Metals, vol. 189, No. 1, January 1951, Trans., pp. 59–63.

World Review.—The general field of semiconductors, of which germanium is an example, was covered in a conference July 10–15, 1950, at the University of Reading, England. Research workers on semiconductors from Great Britain, the United States, Czechoslovakia, France, the Netherlands, Sweden, and Switzerland were reported in attendance. The conference, assisted by the United Nations Educational, Scientific, and Cultural Organization, was under the auspices of the International Union of Physics, in cooperation with the Royal Society.

Occurrence of the mineral renierite $(Cu,Fe)_3$ (Fe, Ge, Zn, Sn) $(S,As)_4$, reported to exist in quantity at Kipushi, Belgian Congo, was further described.[64] Renierite analyses have shown a germaniun content of 6.37 to 7.80 percent. Ash from some Indian coals was shown to contain germanium in the range of 0.1 percent.[65]

(*See* Gallium review, this chapter, for additional information on germanium.)

INDIUM

Production.—Domestic output of indium in 1950 reached an all-time high. Principal producers of indium are the American Smelting & Refining Co., Denver, Colo., and Perth Amboy, N. J., and the Anaconda Copper Mining Co., Great Falls, Mont. Other producers are the American Steel & Wire Co. (subsidiary of U. S. Steel Corp.), Donora, Pa., and the National Zinc Co., Bartlesville, Okla.

TABLE 16.—Producers' shipments of indium, 1941–50 [1]

Year	Troy ounces	Price per troy ounce [2]	Year	Troy ounces	Price per troy ounce [2]
1941	[3] 7,000	(4)	1946	9,667	$2.25
1942	[3] 21,000	$30–$15	1947	13,908	2.25
1943	59,568	$15–$10	1948	12,202	2.25
1944	82,427	$10–$ 7.50	1949	54,784	2.25
1945	57,434	$7.50–$ 2.25	1950	125,777	2.25

[1] Includes metal content of compounds.
[2] Nominal published prices, electrolytic grade, 99.9 percent.
[3] Estimated.
[4] Not available.

Uses.—Indium is consumed principally in producing high-quality engine bearings and, to a smaller extent, in fusible alloys and special solders.

Stocks.—Producers' year-end stocks of indium and its compounds in 1950 were nearly double those of 1949.

Technology.—An exhaustive bibliography on the subject of indium, covering 1863–1949, was published in 1950.[66] The process of recovering indium from the Rammelsberg ores of Germany was described.[67] Several patents were issued pertaining to the production [68] and use [69] of indium.

[64] Lambot, H. (Renierite): Ann. Soc. Geol. Belg., Bull. 73, 1950, pp. 183–6.
[65] Mukherjee, B. and Dutta, R., A Note on the Constituents of the Ashes of Indian Coals Determined Spectroscopically: Fuel, vol. 29, No. 8, Aug. 1950, pp. 190–2.
[66] Ludwick, Maria Thompson, Indium: Indium Corp. of America, Utica, N. Y. June 1950, pp. 7–10.
[67] Kleinert, R., Indium from Rammelsberg Ores: Mining Mag., vol. 83, No. 3, September 1950, pp. 146–151.
[68] Heberlein, Max F. W., and Udin, Harry (assigned to American Metal Co.), Process for Purifying Indium-Containing Material: U. S. Patent 2,526,354, Oct. 17, 1950.
Heberlein, Max F. W., and Bierly, Nevin R. (assigned to American Metal Co.), Electrolyzing Indium Oxide In Fused Caustic Electrolyte: U. S. Patent 2,521,217, Sept. 5, 1950.
[69] Zickrick, Lyall (assigned to General Electric Co.), Thermal Overload Protective Relay Using Indium: U. S. Patent 2,532,265, Nov. 28, 1950.

LITHIUM

Lithium is silver-white and the lightest of all metals, being about half as heavy as water. It is soft, ductile, and readily extrudable, like soft lead.

Production.—Maywood Chemical Works, Maywood, N. J., and Metalloy Corp. (subsidiary of Lithium Corp. of America), Minneapolis, Minn., reported output of lithium metal in 1950. Domestic production usually amounts to a few tens of thousands of pounds a year. Metalloy Corp. completed its program of plant expansion during 1950, making possible enlarged output of lithium metal and other lithium products (*see* Minor Nonmetals chapter, this volume, for information on lithium minerals and chemicals).

Consumption and Uses.—Apparent consumption of lithium metal in 1950 exceeded that for 1949 by about 70 percent.

The principal application for lithium metal is in the metallurgical field for degasification and deoxidation of high-conductivity copper and other nonferrous metals. Lithium metal is also used in certain organic chemical reactions and has figured prominently in press reports as a source of tritium for the thermonuclear bomb ("hydrogen bomb") project of the United States Atomic Energy Commission. Lithium–6, an abundant isotope, present in natural lithium metal, yields tritium when bombarded by neutrons.[70]

Magnesium-lithium alloys, potentially important because of their strength and light weight, continued to hold the interest of research groups.[71]

Prices.—Lithium metal, 98 percent pure, was quoted throughout 1950 at $9.85–$11 per pound by E&MJ Metal and Mineral Markets.

Canada.—The Dominion Department of Mines, Ottawa, Ontario, has been active in research devoted to the direct production of lithium metal from spodumene. Considerable work has been done on the problem of making high-purity lithium, particularly with reference to removing the undesirably high sodium content of currently available commercial lithium metal.

RHENIUM AND TECHNETIUM

Rhenium metal and potassium perrhenate were derived from molybdenite-roaster flue dust by the chemistry department of the University of Tennessee, at Knoxville. The Kupferkammer lead smelter of Mansfeld Kupferbergbau und Hüttenwerk, Hettstedt, Eastern Germany, is reported to have produced rhenium since October 1949.[72] Certain molybdenites are the richest-known natural source of rhenium, containing as much as 0.32 percent Re.[73] The element and its compounds were reviewed and methods described for its extraction and

[70] Business Week, Lithium's Ever-Growing Role in Industry: No. 1099, Sept. 23, 1950, pp. 67–68, 70.
Dement, Jack, Lithium and the Hydrogen Bomb: Eng. and Min. Jour., vol. 152, No. 1, January 1951, p. 83.

[71] Frost, P. D., Jackson, J. H., Loonam, A. C., and Long, C. H., The Effect of Sodium Contamination on Magnesium-Lithium Base Alloys: Jour. Metals, vol. 188, No. 9, September 1950, Trans., pp. 1171–1172.
Frost, P. D., Kura, J. G., and Eastwood, L. W., Aging Characteristics of a Lithium-Magnesium Alloy: Jour. Metals, vol. 188, No. 10, October 1950, Trans., pp. 1277–1282.
Barrett, C. S., and Clifton, D. F., Transformation Characteristics of a Lithium-Magnesium Alloy: Jour. Metals, vol. 188, No. 8, November 1950, pp. 1329–1332.

[72] Metal Bulletin (London), No. 3523, Sept. 8, 1950, p. 16.

[73] Geilmann, W., Lange, G., and Barttlingck, H. (The Rhenium Content of Some Molybdenum Minerals): Neues Jahrb. Mineral., Geol. Monatsch., A. 1945–48, 3–9.

determination in molybdenite [74] and electroplating on base metals.[75] Because of its scarcity, rhenium has found little use other than in research but is known to have exceptional corrosion resistance and catalytic properties.[76]

Technetium, element 43, is closely related to rhenium in properties and was formerly known as masurium. It was first identified in 1937 and produced by bombardment of molybdenum with neutrons or deuterons. Later, a long-lived isotope of technetium, Tc–99, was found to be produced in relatively large proportions as a result of the fission of U–235 in the atomic pile.[77] The half-life of Tc–99 has been tentatively estimated at about 940,000 years.[78] The name technetium derived from the Greek, alludes to the artificial origin of the element, no positive evidence of its existence in nature ever having been observed.

SELENIUM AND TELLURIUM

Production.—Companies reporting output of selenium and tellurium in 1950 were the American Smelting & Refining Co., Baltimore, Md.; U. S. Metals Refining Co., Carteret, N. J.; International Smelting & Refining Co., Perth Amboy, N. J.; and United States Smelting, Refining & Mining Co. (tellurium only), East Chicago, Ind. Facilities for producing selenium and tellurium were installed by the Kennecott Copper Co. at Garfield, Utah, in conjunction with the company's new electrolytic copper refinery. Installation of these new facilities could not be expected to increase the over-all supply of selenium and tellurium, inasmuch as the anode muds to be treated had previously been shipped to recovery plants on the eastern seaboard.

TABLE 17.—Salient statistics of elemental selenium and tellurium in the United States, 1941–45 (average) and 1946–50, in pounds

Year	Selenium					Tellurium		
	Production	Producers' shipments	Producers' stocks at end of year	Imports [1] Pounds	Imports [1] Value	Production	Producers' shipments	Producers' stocks at end of year
1941–45 (average)	558,009	552,062	370,749	136,055	$224,742	130,944	101,338	130,427
1946	291,103	405,226	257,135	[2] 475,881	806,205	3,765	38,523	148,769
1947	512,648	489,415	280,368	529,175	893,171	45,248	71,300	122,717
1948	561,156	570,718	270,806	267,118	489,762	48,806	78,788	92,735
1949	468,502	317,960	334,067	171,581	317,145	109,021	64,278	135,605
1950	511,325	723,128	124,201	363,312	767,952	59,713	98,070	97,249

[1] Includes selenium salts. [2] Revised.

[74] Tribalat, Suzanne (Extraction and Determination of Traces of Rhenium, Especially in the Molybdenites): Anal. chim. acta, vol. 3, 1949, pp.113–125.
[75] Netherton, L. E., and Holt, M. L., Electrodeposition of Rhenium from Aqueous Solutions: Jour. Electrochem. Soc., vol. 95, No. 6, June 1949, pp. 324–328.
[76] Druce, J. G. F., Elemental Rhenium and Some of its Compounds: Chem. Products, vol. 12, No. 9 (new ser.), August 1949, pp. 326–327.
[77] Perrier, C., and Serge, E., Technetium, Element of Atomic Number 43: Nature, vol. 159, No. 4027, Jan. 4, 1947, p. 24.
Coryell, Chas. D., Chemistry of the Fusion Process; The Science and Engineering of Nuclear Power (Clark Goodman, ed.): Addison Wesley Press, Inc., Cambridge, Mass., 1947, vol. 1, ch. 7, pp. 231–250.
[78] Motta, E. E., Boyd, G. E., and Larson, Q. V., Production and Properties of a Long-Lived Radioisotope of Element 43: Phys. Rev., vol. 72, No. 12, 1947, p. 1270.

Consumption and Uses.—Heavy demands for selenium for both civilian and military requirements brought about a critical supply situation in the late months of 1950. The Bureau of Mines initiated measures aimed to increase the supply through development of more effective recovery methods or discovery of new raw-material sources. The National Production Authority began to consider measures for allocating the dwindling supplies.

The major part of selenium consumed is in the elemental form; three principal grades are most commonly used; Commercial Grade (99.5 percent), DDQ (double-distilled quartz, 99.95 percent), and High Grade (99.99 percent plus). Consumption of selenium is confined largely to the electronics, glass, rubber, ferro-alloy, and pigments industries. The electronics industry generally requires the highest-purity grades.

Tellurium is roughly similar to selenium in properties and in certain applications may be substituted for it.

Prices.—The published quotation for selenium, black, powdered, 99.5 percent pure, was $2.00 per pound at the beginning of the year, increased to $2.25 on July 20 and $3.00–3.50 on October 5, and remained unchanged thereafter. Tellurium was quoted at $1.75 per pound throughout 1950, as in 1948 and 1949.

Foreign Trade.—Imports of selenium and salts into the United States in 1950 were principally from Canada, the source of about 94 percent of the total. Most of the remainder was received from Belgium-Luxembourg, Sweden, Germany, and France. No transactions on tellurium and salts were reported. Data on exports of selenium and tellurium from the United States are not available.

Technology.—Papers were published on the electrical properties of antimony-selenium alloys [79] and on methods of electroplating selenium,[80] and of removing both selenium and tellurium from partly refined copper.[81]

World Review.—Total Canadian production of selenium and tellurium in 1950 amounted, respectively, to 261,973 pounds, valued at C$633,975, and 10,075 pounds, valued at C$19,143. International Nickel Co. of Canada, which produces selenium and tellurium at its Copper Cliff refinery near Sudbury, Ontario, reported 1949 shipments of 117,636 pounds of selenium and 9,191 pounds of tellurium. Selenium and its compounds are produced by the same company at its Clydach refinery, near Swansea, Wales, United Kingdom.

Selenium and tellurium are produced in Australia by the Electrolytic Refining & Smelting Co. of Australia Pty., Ltd., Port Kembla, from the company's own anode muds and from those obtained from the Mount Lyell Mining & Railway Co., Queenstown, Tasmania.[82] Australian production of selenium is about 2 tons per annum. Broken Hill Associated Smelters Pty., Ltd., produces tellurium-lead and tellurium-king alloys, output during 1938–47 totaling 810 and 10.9 long tons, respectively.

---

[79] Cullity, B. R., Telkes, M., and Norton, John T., Electrical Resistivity and Thermoelectric Power of Antimony-Selenium Alloys: Trans. Am. Inst. Min. and Met. Eng., Jour. of Metals, vol. 188, No. 1, Jan. 1950, pp. 47-52.

[80] von Hippel, A. and Bloom, M. C., The Electroplating of Metallic Selenium: Jour. Chem. Phys., vol. 18, September 1950, pp. 1243-1251.

[81] Baker, W. A., and Hallowes, A. P. C., Experiments on the Removal of Selenium and Tellurium from Blister and Fire-Refined Copper: Bull. Inst. Min. and Met., No. 521, April 1950, pp. 49-50.

[82] Dimmick, T. D., Minor Metals: Mineral Resources of Australia, Dept. of Supply and Development, Bureau of Mineral Resources, Geology and Geophysics, Summary Rept. 35, September 1949, p. 13.

THALLIUM

Production.—Output of thallium metal and sulfate in the United States generally amounts to a few thousand pounds a year. The American Smelting & Refining Co. is the only domestic producer. During 1950 owners of thallium-rich ore deposits and tailing dumps at Mercur, Utah, continued their efforts to develop new markets for thallium and its compounds.

Consumption and Uses.—Demand for thallium in rodenticides, its principal use, increased markedly in 1950, resulting in an abrupt rise in producers' shipments.

Prices.—Thallium metal and sulfate were offered throughout 1950 at $12.50 and $10.50 per pound, respectively, in 10-pound lots.

Technology.—The Bureau of Mines issued reports on the general subject of thallium [83] and on a method for its spectrochemical determination.[84] Patents were issued covering glass [85] and alloy [86] compositions.

World Review.—Thallium is present in the base-metal ores of Mount Isa, Queensland, Australia. About 1½ tons of thallium per month are reported to enter the smelter, but are not recovered because demand is insufficient to warrant installation of extractive facilities.[87]

ZIRCONIUM

Mine Production.—Domestic output of zircon concentrate in 1950 soared to the highest figure on record, production coming principally from the Rutile Mining Co. of Florida, South Jacksonville, Fla., and the Humphreys Gold Corp., Starke, Fla. A token output was reported by Florida Ore Processing Co., Inc., Melbourne, Fla. The large increase in production in 1950 was accounted for by sharply accelerated zircon recovery at the new plant of Humphreys Gold Corp., which began operations in a small way in 1949. Humphreys Gold Corp. operates the titanium-mineral concentrator of E. I. du Pont de Nemours & Co., at Starke, Fla., on a contract basis; all zircon production of the corporation is ultimately obtained from treatment of concentrator rejects. The du Pont Co. reported that monthly sand output from the dredge to its black-sand concentrator slightly exceeded 500,000 tons in 1950 and that operational difficulties in 1949 had been solved in large part.

Zircon-rich concentrator rejects were accumulated in the vicinity of McCall, Idaho, as a consequence of vigorous development of monazite recovery from black sands in that area; however, no production of high-grade zircon concentrate was reported from Idaho in 1950.

---

[83] Waggaman, William H., Heffner, Gladys G., and Gee, Edwin A., Thallium, Properties, Sources, Recovery and Uses of the Element and its Compounds: Bureau of Mines Inf. Cir. 7553, 1950, 50 pp.

[84] Marks, Graham W., and Potter, E. V., A Method for the Spectrochemical Determination of Thallium in Ores, Concentrates, Dusts and Chemicals: Bureau of Mines Rept. of Investigations 4661, 1949, 13 pp.

[85] Sun, Kuan-Han (assigned to Eastman Kodak Co.), Thallium-Silicate Glass: U. S. Patent 2,472,448, June 7, 1949.

[86] Hensel, F. R., and Larsen, Earl I. (assigned to P. R. Malloy and Co., Inc.), Aluminum-Thallium Bearing: U. S. Patent 2,531,910, Nov. 28, 1950.

[87] Chemical Engineering and Mining Review, vol. 42, No. 12, Sept. 11, 1950, p. 491.

United States reserves of zircon contained in contemporary and ancient beach-sand deposits of Florida and in gold gravels of Idaho are noteworthy. The Bureau of Mines reported Florida zircon reserves to be enormously large as compared with United States requirements.[88]

Stocks.—Industry inventories of zircon (including a small quantity of baddeleyite) at the close of 1950 approximated 8,100 tons compared with 8,700 for 1949. Stocks of unseparated zircon-rutile concentrate at the end of 1950 totaled 2,400 tons (zircon content, about 1,500 tons), compared with only 300 tons (zircon content, 250 tons) for 1949.

Prices.—Zircon concentrate (65 percent ZrO_2), c. i. f. Atlantic ports, per ton, was quoted in E&MJ Metal and Mineral Markets during 1950 as follows: $40–$45, at beginning of year, $42–$47 on July 27, $45–$50 on October 26, and $50–$55 on November 9. Zirconium-metal powder was quoted throughout 1950 at $7–$8 per pound.

TABLE 18.—Zirconium ore (concentrates) imported for consumption in the United States, 1946–50, by countries, in short tons [1]

[U. S. Department of Commerce]

Year	Australia [2]	Brazil	Canada	India	Total	
					Short tons	Value
1946	14,379	2,431	4		16,814	$453,458
1947	21,894	4,619	[3] 2	4,181	30,696	891,161
1948	14,320	3,553	2	279	18,154	571,161
1949	18,839	1,994			20,833	636,529
1950	15,988	697	141		16,826	431,107

[1] Concentrates from Australia are either zircon or mixed zircon-rutile-ilmenite, and those from Brazil are either baddeleyite or zircon. All other imports are zircon only.

[2] Imports of zircon, rutile, and ilmenite from Australia until early 1948 were largely in the form of mixed concentrates. These mixed concentrates are classified by the U. S. Department of Commerce as one of the following: "Zirconium ore," "rutile," or "ilmenite." Total zircon content of the "Zirconium ore" (as shown in this table) and of the "rutile" and "ilmenite" concentrates (*see* Titanium chapter) are estimated as follows: 1946, 11,535 tons; 1947, 22,727 tons; 1948, 13,873 tons; 1949, 14,623 tons; and 1950, 15,098 tons.

[3] Revised figure.

[88] Moon, Lowell B., Bureau of Mines Strategic Minerals Development Program, Summary of Progress, 1939–49: Rept. of Investigations 4647, 1950, 62 pp.

Minor Nonmetals

By F. D. Lamb, O. S. North, H. P. Chandler, and J. C. Arundale[1]

GRAPHITE

PRODUCTION of domestic natural graphite in 1950 decreased to 5,102 short tons compared with 6,102 tons in 1949, while shipments increased to 5,605 tons valued at $427,908 compared with 5,213 tons valued at $475,264. The manufacture of artificial graphite continued to increase, but the Bureau of Mines is not at liberty to publish detailed figures for this type of graphite. There are too few domestic producers to allow publication of separate statistics on natural crystalline and amorphous graphite. However, table 1 shows combined figures for 1945–50.

During the year the Bureau of Standards conducted an investigation of the usability of domestic graphite for the manufacture of crucibles. The investigation is still in progress, but results to date have shown that domestic graphite of comparable flake sizes and carbon content can be used in place of Madagascar flake graphite with equal success.

TABLE 1.—Production and shipments of natural graphite in the United States, 1945–50

Year	Production (short tons)	Shipments: Short tons	Shipments: Value	Year	Production (short tons)	Shipments: Short tons	Shipments: Value
1945	4,888	5,334	$289,207	1948	9,949	9,871	$450,759
1946	5,575	4,844	252,596	1949	6,102	[1] 5,213	475,264
1947	4,387	5,207	221,260	1950	5,102	5,605	427,908

[1] Partly estimated.

Consumption.—Although coverage of the graphite consumption canvass is incomplete, the totals obtained indicate at least the minimum quantities of graphite used in making various products. The 1950 totals for the various uses are shown in table 2.

TABLE 2.—Consumption of natural graphite in the United States in 1950, by uses

Use	Short tons	Value	Use	Short tons	Value
Foundry facings	6,581	$481,196	Paints and polish	175	$16,988
Batteries	3,314	166,200	Packings	127	47,847
Lubricants	3,624	488,921	Retorts	335	83,135
Crucibles	2,200	497,653	Bearings	46	20,456
Stoppers, sleeves, and nozzles	1,080	222,999	Other [1]	2,217	734,818
Pencils	1,179	250,548	Total	20,878	3,010,761

[1] Includes brake lining, carbon brushes, electrodes, etc.

Prices.—Quotations for graphite increased during the year on certain grades, and at the year end the trade-journal listings were as follows: Madagascar, c. i. f., New York, standard grades, 85 to 87

[1] Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

percent carbon, $215 per ton; special mesh $270–$300; special grade 99 percent carbon, $700. Amorphous graphite, Mexican, f. o. b. point of shipment (Mexico), per metric ton $9–$16, depending on grade.

Foreign Trade.—Imports of graphite were considerably greater in 1950 than during 1949, as shown in table 3. The imports amounted to 43,669 short tons valued at $2,080,346—an increase of 37 percent in quantity and 65 percent in value from the 1949 figures. This increase in total imports was due largely to increased production of crystalline flake graphite in Madagascar and amorphous graphite in Ceylon and Mexico.

TABLE 3.—Graphite (natural and artificial) imported for consumption in the United States, 1946–50

[U. S. Department of Commerce]

	Crystalline				Amorphous				Total	
	Flake		Lump, chip, or dust		Natural		Artificial			
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	3,337	$253,163	56	$7,990	29,743	$1,065,835	4	$558	33,140	$1,327,546
1947	2,730	255,556	198	16,325	40,703	1,236,734	28	2,660	43,659	1,511,275
1948	3,496	429,557	554	83,226	48,150	1,529,312	117	4,153	52,317	2,046,248
1949										
Canada	333	54,252	-	-	1,455	136,541	44	1,398	1,832	192,191
Ceylon	-	-	235	27,293	[1] 2,541	[1] 354,331	-	-	[1] 2,776	[1] 381,624
Finland	-	-	-	-	6	200	-	-	6	200
France	16	7,525	-	-	-	-	-	-	16	7,525
Germany	33	7,041	-	-	-	-	-	-	33	7,041
India	-	-	(2)	20	168	30,654	-	-	168	30,674
Korea	-	-	-	-	62	2,776	-	-	62	2,776
Madagascar	1,846	208,550	-	-	-	-	-	-	1,846	208,550
Mexico	-	-	-	-	24,893	417,982	-	-	24,893	417,982
Mozambique	-	-	-	-	173	11,904	-	-	173	11,904
Total	2,228	277,368	235	27,313	29,298	954,388	44	1,398	31,805	1,260,467
1950										
Canada	420	58,329	-	-	2,589	222,410	184	12,518	3,193	293,257
Ceylon	-	-	84	4,709	5,998	621,537	-	-	6,082	626,246
France	51	19,705	-	-	-	-	-	-	51	19,705
Germany	39	5,500	11	1,558	-	-	-	-	50	7,058
India	-	-	-	-	(2)	125	-	-	(2)	125
Japan	-	-	3	624	-	-	-	-	3	624
Madagascar	5,620	641,638	-	-	-	-	-	-	5,620	641,638
Mexico	-	-	-	-	28,601	482,027	-	-	28,601	482,027
Norway	-	-	-	-	7	672	-	-	7	672
United Kingdom	-		2	623	60	8,371	-	-	62	8,994
Total	6,130	725,172	100	7,514	37,255	1,335,142	184	12,518	43,669	2,080,346

[1] Revised figure. [2] Less than 0.5 ton.

The United States tariff rates on graphite, effective January 1, 1948, remained in effect during 1950. They are: Amorphous, natural and artificial, 5 percent ad valorem; crystalline flake, 15 percent ad valorem, with a specific minimum of 0.4125 cent per pound and a specific maximum of 0.825 cent per pound; crucible flake and dust and other crystalline lump and chip, 7½ percent ad valorem.

Exports of natural graphite, 1946–48 were: 1946, 2,313 tons, $267,137; 1947, 1,546 tons, $171,607; 1948, 1,047 tons, $127,931. Data for 1949 and 1950 are shown in table 4.

TABLE 4.—Graphite exported from the United States, 1949–50, by countries of destination

[U. S. Department of Commerce]

Country	Amorphous		Crystalline flake, lump, or chip		Natural, n. e. s.	
	Short tons	Value	Short tons	Value	Short tons	Value
1949						
Austria	2	$488			(1)	$225
Belgium-Luxembourg	1	216				
Bolivia			1	$112		
Brazil			3	893		
Canada	120	6,941	10	4,812	729	59,986
Chile	4	843	20	3,918		
Colombia	1	235			3	450
Cuba	7	1,115	25	3,687	9	894
Czechoslovakia	67	10,759				
Denmark			(1)	103		
Germany	43	5,979				
Greece			4	562		
Guatemala			1	201		
Honduras			(1)	103		
Hong Kong	28	3,280				
Indochina	9	1,516				
Indonesia	19	2,051	2	492		
Italy	35	12,732	2	1,077		
Jamaica			1	217		
Mexico	5	1,729	16	2,893	34	2,934
Netherlands	23	3,602	1	230		
Netherlands Antilles			(1)	108		
Peru			1	189		
Philippines	11	1,576	4	937	4	587
Portugal	7	1,103				
Saudi Arabia			(1)	100		
Sweden	16	2,634				
Switzerland	11	1,560				
Turkey					1	544
United Kingdom	49	8,800			18	4,271
Uruguay			1	186		
Venezuela			2	464	2	360
Total	458	67,159	94	21,284	800	70,251
1950						
Austria	11	1,794			(1)	281
Belgium-Luxembourg	4	506				
Brazil	35	7,931	2	235		
Canada	175	10,066	15	5,728	569	45,850
Chile	2	400	15	2,670		
Colombia			(1)	115		
Cuba	4	434	29	4,549	26	3,884
Czechoslovakia	27	4,482				
Denmark	7	1,470	(1)	111	11	4,760
Dominican Republic			2	396		
France	22	3,122				
Germany	30	3,947				
Guatemala			1	308		
Hong Kong	16	1,732				
Indonesia	2	704				
Israel			(1)	221		
Italy	11	1,916	2	325		
Mexico	5	1,813	24	7,633	6	670
Netherlands	3	349	(1)	159		
Netherlands Antilles			(1)	200		
Norway	10	3,096				
Pakistan			3	2,010		
Peru	1	161	(1)	295		
Philippines	46	6,375	13	2,035	4	666
Southern Rhodesia	15	2,400				
Sweden	56	8,655				
Switzerland	8	1,101				
Union of South Africa	120	18,315				
United Kingdom	46	5,688			11	2,240
Uruguay					1	252
Venezuela			5	1,330	2	320
Total	656	86,457	111	28,320	630	58,923

1 Less than 0.5 ton.

World Review.—Available statistics on world production of graphite for 1944–50 are shown in table 5. Comparable figures for 1915–39 were published in Minerals Yearbook, Review of 1940 (p. 1414), and for 1938–46 in Minerals Yearbook, 1946 (p. 1287).

TABLE 5.—World production of natural graphite, by countries,[1] 1944–50, in metric tons

[Compiled by Helen L. Hunt]

Country [1]	1944	1945	1946	1947	1948	1949	1950
Argentina	455	333	250	(2)	(2)	(2)	(2)
Australia	447	114	353	308	235	126	[3] 62
Austria	22,487	3,483	252	3,845	11,300	14,093	14,685
Brazil (exports)	199	131	92	129	83	137	(2)
Canada	1,435	1,733	1,792	2,175	2,303	1,948	3,231
Ceylon (exports)	12,461	7,946	8,212	9,150	14,221	12,437	13,030
China	[4] 10,000	[4] 10,000	—	—	—	(2)	(2)
Czechoslovakia	21,459	10,973	5,108	7,000	15,000	(2)	(2)
Egypt	260	152	—	—	50	—	—
French Indochina	30	—	—	—	—	—	—
French Morocco	213	262	640	400	284	72	75
Germany: Federal Republic	36,357	(2)	3,800	4,930	5,757	5,097	[5] 6,200
India	942	1,316	1,653	1,255	1,675	988	(2)
Italy	3,008	2,276	2,593	3,845	6,743	4,011	3,855
Japan	10,380	12,444	7,416	10,584	9,132	5,100	3,804
Kenya	10	3	—	—	—	—	(2)
Korea	103,306	32,407	6,204	[5] 10,000	[6] 15,454	[6] 40,671	(2)
Madagascar	14,478	9,185	6,315	5,170	[7] 8,438	[7] 9,767	[7] 12,757
Malaya	[5] 163	[5] 163	—	—	—	(2)	(2)
Mexico	12,977	23,634	21,949	27,984	35,261	23,812	24,626
Mozambique	—	—	200	126	90	110	(2)
Norway	3,784	1,115	661	2,481	1,083	[7] 2,196	[7] 1,902
Southern Rhodesia	5	6	—	—	—	—	—
South-West Africa	1,633	1,318	1,193	1,639	1,627	2,264	1,380
Spain	91	128	320	309	241	256	313
Spanish Morocco	42	100	[5] 120	[5] 150	25	15	(2)
Sweden	—	802	—	—	—	—	(2)
Union of South Africa	324	196	278	221	172	107	244
United States (amorphous and crystalline)	4,906	4,434	5,058	3,980	9,026	5,536	4,628
Total (estimate) [1]	262,000	155,000	75,000	97,000	139,000	149,000	134,000

[1] In addition to countries listed, graphite has been produced in Bulgaria, Finland, French Equatorial Africa, Greenland, Nyasaland, Peru, Uruguay, and U. S. S. R., but production data are not available. No estimates for these countries are included in totals.
[2] Data not available; estimates by author of chapter included in total.
[3] Excluding South Australia.
[4] Estimated Japanese imports from Manchuria.
[5] Estimate.
[6] South Korea only.
[7] Exports.

Exports of graphite from Madagascar in 1950 were greater than in any year since 1944 and reached a total of 12,757 metric tons. However, at the end of the year there was a shortage of Madagascar graphite, caused by an increase in world demand, Government purchasing, and lack of consumers' stocks which had been used up during 1948–49.

GREENSAND

Domestic firms reported the production of 3,935 short tons of greensand during 1950. The following companies reported production: The Permutit Co., 330 West Forty-second Street, New York 18, N. Y., Zeolite Chemical Co., Medford, N. J., and the Inversand Co., 226 Atlantic Avenue, Clayton, N. J. As for the past several years, all production was from open-pit operations in Burlington and

Gloucester Counties, N. J., and was sold for use in water softening and purification.

Prices of refined greensand, f. o. b. shipping point, ranged from approximately $62 to $115 per short ton.

TABLE 6.—Greensand marl sold or used by producers in the United States, 1945–50

Year	Short tons	Value	Year	Short tons	Value
1945	4,986	$477,919	1948	7,269	$392,959
1946	5,140	424,900	1949	6,128	276,564
1947	8,337	432,980	1950	3,935	304,321

KYANITE, ANDALUSITE, SILLIMANITE, AND DUMORTIERITE

Production.—The Bureau of Mines is not at liberty to publish the figures on domestic production of kyanite because there were only two producers during the year. These were Commercialores, Inc., 39 Cortlandt Street, New York, N. Y., from deposits near Clover, S. C., and Kyanite Mining Corp., Cullen, Va., from a property near Farmville, Prince Edward County, Va. Both of these firms reported increased output during the year.

All former producers of andalusite and dumorierite reported cessation of operations before 1950.

Results of a Bureau of Mines investigation of a South Carolina deposit of sillimanite-schist were published.[2] The deposit is in Spartanburg County. The exploration work consisted of six diamond-drill holes totaling over 680 feet. Although the maximum limits of mineralization have not been determined, the work indicated that the deposit is relatively shallow, with the content of 20 samples ranging from 3 to 30 percent sillimanite in the schist.

Consumption and Stocks.—Consumption of imported kyanite was 15,874 short tons in 1950 compared with 9,655 short tons in 1949.

Year-end stocks of imported kyanite were 4,772 short tons in 1950 compared with 4,664 short tons in 1949.

Prices.—Trade-journal quotations for domestic kyanite in December 1950 per ton f. o. b. point of shipment, Virginia, were as follows: 35-mesh, carlots, in bulk $26, in bags $29; for 200-mesh, in bags, carlots $37. Imported kyanite in bags was quoted at $47 to $50 per ton nominal, c. i. f. Atlantic ports.

Foreign Trade.—Data on imports and exports of kyanite and allied minerals are shown in table 7. Imports of 17,417 tons, principally from India and British East Africa, were the largest on record, with imports from India nearly double those of the previous year.

Angola.—The local press announced the discovery of kyanite in Angola in what are alleged to be fairly extensive deposits. They were discovered by technical personnel of the Services of Geology and Mines of the Angolan Government.[3]

Another showing of kyanite was disclosed in a mica operation. The operator's preliminary survey indicates a minimum of 5,000 to 6,000

[2] Dosh, Harry G., Investigation of the Gideon Sillimanite Deposit, Spartanburg County, S. C.: Bureau of Mines Rept. of Investigations 4610, 1950, 9 pp.

[3] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 1, January 1950, p. 40.

TABLE 7.—Kyanite imported for consumption and kyanite and allied minerals exported from the United States, 1946–50

[U. S. Department of Commerce]

Imports		
Year and origin	Short tons	Value
1946	11,374	$130,341
1947	12,182	150,674
1948	17,091	259,055
1949		
Australia	7	69
British East Africa	6,342	146,520
India	5,434	163,653
Mozambique	336	14,614
Total	12,119	324,856
1950		
Australia	337	2,785
British East Africa	6,107	226,671
India	10,547	325,131
Mozambique	426	33,232
Total	17,417	587,819

Exports		
Year and destination	Short tons	Value
1946	342	$17,881
1947	239	[1] 20,553
1948	462	21,813
1949		
Canada	588	21,472
Italy	242	16,500
Mexico	169	5,837
Netherlands	20	2,100
Switzerland	20	816
Total	1,039	46,725
1950		
Canada	362	12,493
Greece	6	190
Italy	144	6,756
Mexico	412	13,311
United Kingdom	17	3,000
Total	941	35,750

[1] Revised figure.

tons of reserves and a possibility of 20,000 tons. The principal deterrents to exploitation of the deposit, should it prove satisfactory in analysis, are the high costs of transportation over poor roads to the port of Luanda, the critical shortage of native labor, and lack of water supply.[4]

India.—Kyanite produced in Bihar and Orissa is exported almost entirely to foreign markets. Consumption of kyanite by the refractory industry in India is negligible. The occurrence of kyanite in the Thirumalapur and Mavinkere areas of the Hassan District, Mysore State, was noted before 1929; however, the deposit was not worked until 1943. In the Thirumalapur area kyanite occurs as a bladed variety in a schist belt. Work in a small area indicates that reserves may not exceed 50,000 tons. However, additional areas in the same region contain kyanite. In the Mavinkere area massive bluish kyanite occurs in association with a peculiar type of pinkish corundum. The kyanite zone is reported to be over 880 yards long and 200 to 600 feet wide. The kyanite occurs in lode form, with an average thickness of 40 feet in the exposed area. Investigation of the exposed area indicates that the lode extends beyond a depth of 30 feet. On the basis of a 30-foot depth, reserves were calculated to exceed 250,000 long tons. New areas in this locality are being investigated.[5]

Surinam.—The Sara Creek Goldfields Co. obtained a grant of 25,000 guilders to prospect for and develop a deposit of kyanite reported to occur on the Lawa River. The funds were obtained from the "Prosperity Fund" furnished by the Netherlands.[6]

[4] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 5, May 1950, p. 36.
[5] Bureau of Mines, Mineral Trade Notes: Vol. 30, No. 6, June 1950, p. 38.
[6] Bureau of Mines, Mineral Trade Notes: Vol. 31, No. 5, November 1950, p. 47.

LITHIUM MINERALS

Rapid increase in the consumption of lithium minerals and compounds resulted in shipments during 1950 of 9,306 short tons of lithium-bearing ores and compounds containing 747 short tons of Li_2O—a figure exceeded only in 1944. At the end of the year the outlook was for further expansion of consumption of lithium minerals and compounds, and most of the producers had plans for expanding or had completed expanding their facilities for both mining and processing lithium ores and compounds. The Metalloy Corp. had completed a program of expansion of its facilities at Minneapolis.[7]

Foote Mineral Co. acquired properties near Kings Mountain, N. C., on which large deposits of spodumene-bearing ore occur, as well as the plant at this property, which was operated during World War II for recovering spodumene. Operations were suspended in February 1945 after Government contracts were canceled. The firm began rehabilitating this plant and planned to resume production in the fall of 1951. Indicated and inferred reserves of spodumene in the pegmatites of this area are considered to be very large.

TABLE 8.—Shipments of lithium ores and compounds from mines in the United States, 1935–39 (average) and 1946–50

Year	Ore (short tons)	Value	Li_2O (short tons)	Year	Ore (short tons)	Value	Li_2O (short tons)
1935–39 (average)	1,327	$48,280	88	1948	3,881	$210,792	291
1946	3,065	303,892	323	1949	4,838	345,970	475
1947	2,441	151,113	199	1950	9,306	579,922	747

Production.—In 1950 the following firms reported production of lithium ores and compounds: American Potash & Chemical Corp., 3030 West Sixth Street, Los Angeles 54, Calif., on Searles Lake (crude sodium lithium phosphate); Black Hills Keystone Corp., Keystone, S. Dak. (amblygonite and spodumene); George C. Bland, Hill City, S. Dak. (spodumene); Walter Clifford, Custer, S. Dak. (spodumene); John Fisher, Custer, S. Dak., mine at Keystone (spodumene); Lithium Corp. of America, Inc., 2560 Rand Tower, Minneapolis, Minn., mine at Keystone, S. Dak. (spodumene); Maywood Chemical Works, Maywood, N. J., mine at Keystone, S. Dak. (spodumene); New Mexico Mining & Construction Co., Dixon, N. Mex. (lepidolite); and Whitehall Co., Inc., 17 Battery Place, New York 4, N. Y., mine at Newry, Maine (spodumene).

Uses.—The commercial possibilities of the mineral petalite, a lithium-aluminum silicate, were discussed in an article.[8] Recent discoveries of substantial quantities of petalite in southwest Africa have improved the likelihood of this material being commercially utilized in heat-resisting ceramics, porcelain enamels, and glasses.

The use of lithium-base greases has increased rapidly in the past few years, and this use accounts for a large portion of the consumption of

[7] Oil, Paint and Drug Reporter, vol. 157, No. 17, Apr. 24, 1950, p. 42.
[8] Clark, John D., Petalite—A New Commercial Mineral: Min. Eng., Trans. Am. Inst. Min. and Met. Eng., vol. 187, No. 10, October 1950, pp. 1068–1070.

lithium compounds. A detailed discussion of the uses of lithium-base "all-purpose" greases and their preparation was presented in an article.[9] Another very important use for lithium minerals and compounds is in various types of ceramic materials and glasses. A publication issued during the year reviewed these uses. This publication also contains an excellent bibliography of lithium ceramic references.[10]

The properties and uses of lithium chemicals as presented in the literature since 1940 were summarized in a booklet issued during the year.[11]

The applications and potential uses of lithia-bearing compounds in whiteware were reviewed briefly.[12]

A comprehensive discussion of spodumene as a flux in sanitary chinaware bodies was presented. Four groups of body compositions involving partial replacement of feldspar by spodumene were investigated.[13]

Technology.—A research project designed to produce additional data on the general fluxing characteristics of spodumene in glasses and whiteware bodies was initiated by the Department of Engineering Research, North Carolina State College, Raleigh, N. C.[14]

The results of valuable basic research in the lithia-alumina silica system were published.[15]

The production of lithium and other metals by the vacuum metallurgy method was reviewed.[16]

The production of lithium chloride and metallic lithium was discussed in an article.[17]

Prices.—Trade-journal quotations of prices for lithium ores were as follows: Amblygonite, air-floated, carlots, unchanged at $110 per ton; lepidolite, 4 percent Li_2O, powdered, carlots, unchanged at $80 per ton; spodumene, per short ton unit lithium oxide contained, unchanged at $6–$8 on 6-percent grade, carlots. These prices are nominal.

The American Potash & Chemical Corp. announced a price increase of approximately 10 percent effective November 1 on the dilithium sodium phosphate. The new price was $9 per unit of Li_2O.[18]

Canada.—The lithium-bearing pegmatites in northern Quebec were described in considerable detail. Lithium minerals occur in many of the pegmatites along the margins of a granitic stock in LaCorne Township, north of Val d'Or, Quebec. These dikes are unusually uniform in texture and average percentage of the spodumene in individual dikes. One series shows an average spodumene content of about 25 percent.[19]

---

[9] Meyer, H. C., Jr., Lithium-Base Greases Now Replace Many Earlier Types: Petrol. Eng., January 1950, pp. 758–762.

[10] Foote Prints, Lithium in Modern Ceramics: vol. 22, No. 2, December 1950, 41 pp.

[11] Foote Mineral Co., Lithium in Modern Industry: Philadelphia, January 1950, 25 pp.

[12] Ceramic Industry, vol. 54, No. 6, June 1950, p. 104.

[13] Cowan, C. A., Bole, G. A., and Stone, R. L., Spodumene as a Flux Component in Sanitary Chinaware Bodies, Am. Ceram. Soc. Jour., vol. 33, No. 6, June 1950, pp. 193–197.

[14] Ceramic Age, vol. 55, No. 2, February 1950, p. 96.

[15] Roy, R., Roy, D. M., and Osborn, E. F., Compositional and Stability Relationships Among the Lithium Aluminosilicates: Eucryptite, Spodumene, and Petalite: Am. Ceram. Soc. Jour., vol. 33, No. 5, May 1950, pp. 152–159.

[16] Schlechten, A. W., Vacuum Metallurgy—a New and Growing Industry: Eng. and Min. Jour., vol. 151, No. 7, July 1950, pp. 71–73.

[17] Dennis, W. H., The Rarer Metals: Mine and Quarry Eng. (London), vol. 16, No. 6, June 1950, pp. 173–178.

[18] Oil, Paint and Drug Reporter, vol. 158, No. 18, Oct. 30, 1950, p. 4.

[19] Derry, Duncan R., Lithium-Bearing Pegmatites in Northern Quebec: Econ. Geol. and Bull. Soc. Econ. Geol., vol. 45, No. 2, March–April 1950, pp. 95–104.

TABLE 9.—Lithium minerals produced in South West Africa, 1948–50, in short tons [1]

Mineral	1948	1949	1950
Amblygonite	176	130	292
Lepidolite	1,361	895	9,318
Petalite	179	133	180
Total	1,716	1,158	9,790

[1] Union of South Africa, Department of Mines, Industrial Minerals Quarterly Information Circular 1950.

MEERSCHAUM

Meerschaum is a soft, fine-grained, earthy material used principally in manufacturing pipes and other smokers' articles. Virtually all of the world's supply comes from deposits in Asia Minor. A few scattered deposits in the United States have yielded only a small production. Imports from Turkey, the only supplier for several years, increased substantially. A small quantity arrived from Italy.

TABLE 10.—Meerschaum imported for consumption in the United States, 1945–50 [1]

[U. S. Department of Commerce]

Year	Pounds	Value	Year	Pounds	Value
1945	33,292	$59,418	1948	3,000	$10,070
1946	14,469	21,785	1949	5,844	13,897
1947	5,758	10,534	1950	9,621	18,549

[1] 1945–49, all from Turkey; 1950—Italy, 20 pounds, $120; Turkey, 9,601 pounds, $18,429.

MINERAL EARTH PIGMENTS

Production.—The demand for mineral-earth pigments increased sharply in 1950 because of the high level of construction and industrial activity. The trend toward synthetic pigments continued, as for the past several years. During 1950 synthetic pigments were 35 percent of the total tonnage sold and 62 percent of the total value of sales. Although demand in the first part of the year was lower than in the previous year, paint manufacturers continued to call for increasing quantities. During the early part of the year supplies were ample, but later in the year some shortages developed, particularly in the pure red and yellow oxides.

The occurrence and uses of mineral pigments were outlined in an article.[20] The hiding power (opaqueness) of certain iron oxides and the method for determining such were discussed in an article.[21]

[20] South African Mining and Engineering Journal, vol. 61, No. 2986, May 6, 1950, p. 309.
[21] Oil, Paint and Drug Reporter, vol. 158, No. 20, November 1950, p. 83.

TABLE 11.—Natural mineral pigments and manufactured iron-oxide pigments sold by processors in the United States, 1949–50, by kinds

Pigment	1949		1950	
	Short tons	Value	Short tons	Value
Mineral blacks	[1] 16,703	[1] $270,943	20,615	$345,492
Precipitated magnetic blacks	1,415	320,858	1,994	458,518
Natural brown oxides (metallic browns)	4,962	259,413	7,923	458,030
Vandyke brown (finished pigment)	106	18,199	209	39,901
Pure browns (96 percent or better iron oxides)	958	243,943	1,258	320,514
Natural red oxides	18,082	807,800	19,027	1,047,602
Pure red oxides (98 percent or better Fe_2O_3)	15,918	3,661,241	21,911	5,156,425
Venetian reds	4,598	418,043	5,721	528,287
Pyrite cinder	1,637	121,650	1,957	147,352
Other red iron oxides	16,091	1,867,795	18,012	2,265,249
Natural yellow oxides (high Fe_2O_3)	5,149	113,154	5,437	125,626
Pure yellows (85 percent or better Fe_2O_3)	8,898	1,611,076	12,767	2,425,927
Ocher (low Fe_2O_3)	3,989	125,091	3,506	132,374
Siennas:				
Burnt	751	117,722	1,256	209,417
Not burnt	1,160	164,765	1,477	216,031
Umbers:				
Burnt	2,481	294,610	4,130	506,844
Not burnt	629	64,951	963	106,343
Other	795	92,084	1,093	272,850
Total	[1] 104,322	[1] 10,573,338	129,256	14,762,782

[1] Revised figure.

Prices.—According to the Oil, Paint and Drug Reporter, prices were quoted as follows during December 1950 (in cents per pound, bags, works, carlots, unless otherwise noted):

Synthetic iron brown (l. c. l.), 12.
Metallic oxide brown, 3.75.
Sap brown, crystals, 12.
Sap brown, powdered, 13.
Sienna, burnt, 4¼–15¼.
Sienna, raw, 4½–13.
Umber, burnt, American (barrels), 5¼.
Umber, Turkey type, 6¼.
Vandyke (barrels), 11.
Synthetic red iron oxide, 11¾.
Special, high color, synthetic red iron oxide, 60.
Persian Gulf oxide, 6¾.
Spanish oxide, Grade 1 (barrels), ex dock, 5¾.
Venetian reds, 3½–5¼.
Natural yellow iron oxide, 1.41.
Natural yellow iron oxide, French type, 4½.
Natural yellow iron oxide, Peruvian type, 1.85.
Synthetic yellow iron oxide, 9½.
Golden American yellow ocher, 1¼.
Metallic red (barrels), 2½.
Synthetic iron oxide black, 11.
Mineral black, 1.6.

Foreign Trade.—Imports and exports of mineral pigments are shown in tables 12 and 13.

TABLE 12.—Selected mineral pigments imported for consumption in the United States, 1947–50

[U. S. Department of Commerce]

Pigments	1947		1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Iron oxide pigments:								
Natural	3,755	$250,137	1,967	$138,169	1,194	$94,343	2,803	$143,894
Synthetic	595	94,937	705	112,363	767	120,281	2,220	294,017
Ocher, crude and refined	258	14,362	89	4,975	89	5,058	157	6,759
Siennas, crude and refined	725	65,787	251	22,064	211	16,567	474	33,433
Umber, crude and refined	2,206	59,524	1,695	45,130	1,758	47,730	3,259	88,168
Vandyke brown	253	23,955	222	20,198	118	11,757	261	18,562
Total	7,792	508,702	4,929	342,899	4,137	295,736	9,174	584,833

TABLE 13.—Dry ocher, sienna, umber, and other forms of iron oxide for paint exported from the United States, 1947–50, by countries

[U. S. Department of Commerce]

Country	1947		1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Argentina	98	$21,522	9	$1,904	9	$2,549	(1)	$1,082
Austria	------	----------	2	494	37	9,354	41	10,274
Belgian Congo	------	----------	7	773	------	----------	6	856
Belgium-Luxembourg	759	148,725	631	123,070	201	39,467	85	15,035
Bolivia	6	1,358	1	560	21	7,555	2	900
Brazil	396	94,122	103	25,665	155	43,575	27	16,056
Canada	3,234	337,037	2,974	259,540	3,076	248,780	2,945	274,311
Chile	95	22,563	110	25,664	80	14,801	------	----------
China	158	34,873	87	27,044	21	5,081	18	9,470
Colombia	216	63,449	112	33,501	110	38,891	114	39,986
Cuba	307	53,716	269	50,643	298	41,395	284	54,724
France	157	27,569	------	----------	24	8,132	17	8,646
Greece	1	156	135	24,539	75	18,158	14	2,657
Guatemala	44	10,829	38	9,952	35	14,294	53	13,955
Haiti	39	4,015	41	4,014	42	4,242	63	6,133
Hong Kong	89	22,748	62	15,400	77	20,210	5	1,295
India	10	3,616	88	59,611	2	634	27	10,099
Italy	14	6,905	71	20,713	118	33,614	51	12,754
Mexico	183	44,238	123	28,417	124	30,191	85	25,323
Netherlands	487	44,953	824	96,546	452	44,026	227	9,029
Netherlands Antilles	11	2,683	14	3,754	17	5,097	11	2,266
Panama	13	3,598	94	6,770	8	2,103	61	5,965
Peru	29	8,732	19	3,057	21	4,827	12	3,760
Philippines	89	17,839	62	11,919	132	23,169	85	17,729
Portugal	77	18,330	32	7,933	38	9,118	7	1,587
Sweden	145	26,577	11	2,887	7	2,058	5	1,341
Switzerland	47	10,618	56	12,059	34	3,733	3	801
Union of South Africa	50	10,244	94	25,672	121	32,746	82	20,776
United Kingdom	276	10,907	469	18,750	807	31,312	809	30,926
Uruguay	52	11,231	82	18,580	------	----------	39	9,066
Venezuela	153	30,038	159	41,370	141	41,571	257	70,111
Other countries	378	94,122	150	40,926	160	46,191	133	36,277
Total	7,613	1,187,313	6,929	1,001,727	6,443	826,874	5,568	713,190

[1] Less than 0.5 ton.

232294—53——86

MINERAL WOOL

The total value of mineral wool produced in this country in 1950 from rock, slag, and glass was $120,945,000 compared with $93,-023,000 in 1949, an increase of 30 percent, according to the Bureau of the Census. The 1947 report of the Bureau of the Census on mineral wool gives the following percentages for the broad classifications of its use: Structural insulation 56 percent, equipment insulation 23 percent, industrial insulation 17 percent, and unspecified 4 percent. A more detailed list of end uses can be found on page 1362 of the Minerals Yearbook 1948. The average number of persons employed by the mineral-wool industry during 1950 was 9,244, compared with 7,544 for the previous year.

Exports of mineral-wool products from the United States during 1950 amounted to $1,132,454.

An article describing the various materials suitable for the manufacture of mineral wool, the different processes in use, its appearance and insulating properties, and its application as an insulating material, appeared recently in a technical magazine.[22]

The new plant of the Owens-Corning Fiberglass Corp. at Santa Clara, Calif., was the subject of an article in the trade press. The raw materials used, manufacturing processes, and a description of the finished products were given, as well as the processing of the mineral wool for commercial application.[23]

Other new plants have been described in the trade journals.[24]

A new insulation has been put on the market by a well-known manufacturer of mineral wool. It comes in four densities—from 0.5 to 1 pound per cubic foot.[25]

Patents covering a method of waterproofing mineral wool [26] and for the production of mineral wool from molten material [27] have recently been issued.

MONAZITE
(Rare-Earth Minerals)

For many years supplies of monazite came from India, but in 1946 the Indian Government placed an embargo on shipments of monazite from that country. Subsequent to that, nearly all of our supply came from Brazil, but recently the Brazilian Government restricted shipments. The United States was then forced to find other sources. For several years important deposits have been known to occur in old beach sands of Florida and the placer sands and gravels of the Boise

[22] Mineralogist, vol. 23, No. 11, November 1950, pp. 536–540.
[23] Warren, Richard F., Owens-Corning Meets Growing Demand with New Fiberglass Unit at Santa Clara: Chem. Eng., vol. 56, No. 7, July 1949, p. 187.
[24] Rock Products, vol. 53, No. 12, December 1950, p. 111.
Pit and Quarry, vol. 43, No. 2, August 1950, p. 51.
Chemical and Engineering News, vol. 28, No. 42, Oct. 16, 1950, p. 3669.
[25] Chemical and Engineering News, vol. 27, No. 49, Dec. 5, 1949, p. 3660.
[26] Zettel, Joseph H. (assigned to Johns-Manville Corp.), Method of Waterproofing Mineral Wool: U. S. Patent 2,493,845, Jan. 10, 1950.
[27] Richardson, Charles D., Mineral Wool Making Means: U. S. Patent 2,491,766, Dec. 20, 1949.

Basin in Idaho. There was production from both these areas in 1950; however, statistics on output, consumption, and imports of monazite are considered to be confidential and cannot be published for 1950. Further prospect of the United States becoming self-sufficient in rare earth minerals is indicated by discovery of a deposit of bastnäsite, a fluocarbonate of the rare earths, in San Bernardino County, Calif., and of rare-earth-bearing minerals in several other locations. However, utilization of these materials is in the research stage.

It was announcd that the Climax Molybdenum Co. expected to recover monazite, as a byproduct in its operations at Climax, Colo.[28]

The Bureau of Mines Rare and Precious Metal Experiment Station at Reno, Nev., investigated bastnäsite found recently in California.[29]

The known occurrences of monazite in Georgia were listed.[30]

There was continued interest and research on thoria ceramic refractory materials.[31]

A rapid method determining thorium in monazite sand was outlined.[32]

World Review.—World-wide occurrences of monazite were reviewed briefly in an article.[33]

In Australia research continued on the fundamental chemistry of the components of monazite, and the results so far were incorporated in a plan for improved chemical processing of this mineral.[34]

Titanium and Zirconium Industries Pty., Ltd., and other firms expect to produce monazite from the beach sands of Queensland, Australia.[35]

Several placer deposits in British Columbia and the Northwest Territories are known to contain monazite.[36] A summary of information on Canadian deposits of uranium and thorium through 1948 was presented.[37]

It was again reported that a plant for processing monazite sand would be established in India at Alwaye, near Erankulam.[38]

The occurrences of monazite in Brazil were described in some detail in an article.[39]

According to E&MJ Metal and Mineral Markets, price quotations on monazite during the year were advanced to 17 cents per pound, f. o. b. Atlantic ports, basis 65 percent of total rare-earth oxides, including thorium and cerium oxides. Lower-grade material can be sold at a penalty. This price was nominal.

---

28 Engineering and Mining Journal, vol. 151, No. 6, June 1950, p. 115.
29 Steel, vol. 127, No. 3, July 1950, p. 61.
30 Georgia Mineral Society News Letter, vol. 3, No. 3, May–June 1950, pp. 72–73.
31 American Ceramic Society Bulletin, vol. 29, No. 3, March 1950, p. 102.
Lang, S. M. and Geller, R. F., The National Bureau of Standards Thoria-Resistor Furnace: Am. Ceram. Soc. Bull., vol. 29, No. 3, March 1950, p. 118.
32 Dutt, N. K., Rapid Determination of Thorium in Monazite Sand: Sci. and Culture, vol. 15, 1950, pp. 448–449; Chem. Abs., vol. 44, No. 19, 1950, p. 8820.
33 Fox, Sir Cyril S., Mineral Supplies for Atomic Energy: Min. Jour. (London), vol. 234, No. 5980, pp. 310–312.
34 Chemical Engineering and Mining Review, Minerals Utilization Studied by C. S. I. R. O.: vol. 42, No. 9, June 10, 1950, p. 359.
35 Engineering and Mining Journal, vol. 150, No. 7, July 1949, p. 202.
36 Mining Engineering, vol. 187, No. 2, February 1950, p. 255.
37 James, W. F., Lang, A. H., Murphy, Richard, and Kesten, S. N., Canadian Deposits of Uranium and Thorium: Min. Eng., vol. 187, No. 2, February 1950, pp. 239–255.
38 Mining Journal, vol. 235, No. 6007, Oct. 6, 1950, p. 318.
39 Lafer, Horácio, Areias Monazíticas: Mineracão e metalurgia, vol. 14, No. 84, March–April 1950, pp. 155–160.

OLIVINE

Sales of olivine in 1950 increased to 4,577 short tons valued at $64,144 from 3,528 short tons valued at $56,850 in the preceding year. The following firms reported production of olivine during the year: Harbison Walker Mining Co., Farmers Bank Building, Pittsburgh, Pa., from its Addie quarry near Addie, N. C.; The United Feldspar & Minerals Corp., Spruce Pine, N. C., from its Wray mine near Green Mountain, N. C.; and The H. P. Scheel Co. from its Big Slide mine near Sedro-Woolley, Wash. This material was used in the production of fire brick for furnace lining, foundry sand, and refractory cements.

TABLE 14.—Olivine sold or used by producers in the United States, 1946–50

Year	Short tons	Value	Year	Short tons	Value
1946	7,649	$92,868	1949	3,528	$56,850
1947	10,838	129,094	1950	4,577	64,144
1948	4,766	86,230			

A review of recent developments and techniques in the manufacture and use of forsterite refractories was published.[40]

PERLITE

The production and sales of perlite and its products set new records in 1950. Production of 110,694 short tons of crude was reported—an increase of 55 percent over the 1949 total. Furnace operators reported total sales of expanded perlite at 86,962 short tons valued at $4,741,383.

Sixty-three firms reported production and sale of crude perlite or expanded material in 1950. Of these, 12 produced both crude and popped perlite, 8 operated mines only, and 43 maintained furnace facilities only. Fourteen companies are known to be in operation in California, 6 in Utah, 4 each in Arizona, Texas, and Pennsylvania, 3 each in Illinois and Nevada, and 1 or 2 in each of 19 other States. Nine other companies reported plans to begin mine or furnace operations in the near future.

Mine development during the year included completion of a large crushing and sizing plant by Great Lakes Carbon Corp., New York, N. Y., at its Socorro, N. Mex. property.[41] The Alexander Film Co., Colorado Springs, Colo., offered the perlite facilities of the AleXitE Engineering Division for sale,[42] and Perlite Mines Co., Denver, Colo., made plans to purchase and operate the mine and plant units, principally to supply crushed and graded ore to eastern and midwestern expanders. Combined Metals Reduction Co., Salt Lake City, Utah, stepped up production of ore from its extensive deposits in eastern Nevada, near Pioche, to gain a major position among producers of crude ore.[43]

[40] Cordwell, F. F., Refractories Developments: Refractories Jour., vol. 26, No. 2, February 1950, pp. 30–35.
[41] Engineering and Mining Journal, vol. 151, No. 4, April 1950, p. 143.
[42] Rock Products, vol. 53, No. 6, June 1950, p. 85.
[43] Lenhart, W. B., Processing Perlite Ore for Controlled Expansion: Rock Products, vol. 53, No. 10, October 1950, pp. 98–100.

TABLE 15.—Production and sales of perlite in the United States, 1946–50

Year	Crude perlite					Expanded perlite		
	Production	Sold		Used at own plant to make expanded material		Production	Sold or used	
	Short tons	Short tons	Value	Short tons	Value	Short tons	Short tons	Value
1946	[1] 4,750	[1] 1,500	[1] $8,300	[1] 3,100	[1] $16,300	[1] 4,100	[1] 2,600	[1] $92,500
1947	[1] 10,500	[1] 550	[1] 3,000	[1] 9,900	[1] 55,000	[1] 9,700	[1] 7,700	[1] 271,000
1948	[1] 22,200	[1] 4,400	[1] 29,000	[1] 17,700	[1] 105,000	[1] 21,200	[1] 18,600	[1] 742,000
1949	[1] 71,500	[1] 27,300	[1] 193,000	[1] 43,800	[1] 317,000	[1] 58,100	[1] 52,200	[1] 2,385,000
1950	110,694	59,802	411,205	41,734	237,957	88,892	86,962	4,741,383

[1] Revised figure.

During the year reports were made of perlite deposits in Utah,[44] California,[45] New Mexico,[46] Washington,[47] Canada,[48] and Mexico.[49]

Several new or improved furnaces were reported in 1950.[50]

Patents were granted covering five furnaces or processes applicable to perlite.[51] These furnaces include a vibrating hearth apparatus, a vertical stationary, a horizontal rotary, a stationary horizontal with preheater, and a horizontal explosion unit with a vertical cooling-separation chamber.

A careful study of perlite furnacing problems and the principal furnace types was published.[52] The authors reported four variables of major importance in producing an economical and high-grade product: Perlite type, heating time, particle size, and temperature. Eight furnace types were described and evaluated according to the various aspects of performance.

Other articles detailed the complete operations of Great Lakes Carbon Corp.[53] and AleXitE Engineering Division.[54]

[44] Mining World, vol. 12, No. 7, June 1950, p. 65.
[45] Chesterman, C. W., Perlite Deposits in Sonoma County, Calif.: California Jour. Mines and Geol., vol. 46, No. 1, January 1950, pp. 81–82.
[46] Mining World, vol. 12, No. 2, February 1950, p. 69.
[47] Huntting, M. T., Perlite and Other Volcanic Occurrences in Washington: Washington Dept. Conservation and Development, Div. Mines, Olympia, Wash., 77 pp.
[48] Northern Miner (Toronto), vol. 36, No. 17, July 20, 1950, p. 19.
[49] Engineering and Mining Journal, vol. 151, No. 6, June 1950, p. 136.
[50] Rock Products, vol. 53, No. 2, February 1950, p. 93.
Rock Products, vol. 53, No. 3, March 1950, pp. 60–61.
Rock Products, vol. 53, No. 6, June 1950, p. 92.
Pit and Quarry, vol. 42, No. 10, April 1950, pp. 100–101.
[51] Flint, E. P., and others (assigned to The Cudahy Packing Co., Chicago, Ill.), Beneficiation of Volcanic Ash: U. S. Patent 2,496,203, Jan. 31, 1950.
Pierce, H. L., Process for Expanding Earth Materials: U. S. Patent 2,501,962, Mar. 28, 1950.
Johnson, W. E., and others (assigned to Great Lakes Carbon Corp., New York, N. Y.), Process and Furnace for Expanding Perlite: U. S. Patent 2,505,249, Apr. 25, 1950.
Stafford, W. L., and others (assigned to Johns-Manville Corp., New York, N. Y.), Perlite Expanding Apparatus: U. S. Patent 2,521,190, Sept. 5, 1950.
Essex, J. L., Method and Apparatus for Expanding Minerals: U. S. Patent 2,531,975, Nov. 28, 1950.
[52] Murdock, J. B., and Stein, H. A., Comparative Furnace Designs for the Expansion of Perlite: Min. Eng., vol. 187, No. 1, January 1950, pp. 111–116.
[53] Mining World, Permalite—Rock to Plaster: vol. 12, No. 11, October 1950, pp. 28–31.
Rock Products, Great Lakes Carbon Corp. Holds Open House at New Perlite Plant: vol. 53, No. 8, August 1950, pp. 192–194.
[54] Taylor, C. W., and Wilfley, R. D., Processing of Perlite Ore: Rock Products, vol. 53, No. 2, February 1950, pp. 92–96, 143.
Wilfley, R. D., and Taylor, C. W., Perlite Mining and Processing—A New Industry for the West: Eng. and Min. Jour., vol. 151, No. 6, June 1950, pp. 80–83.
Taylor, C. W., Perlite Popping: From a Shaky Start a Solid New Industry: Chem. Eng., vol. 57, No. 1, January 1950, pp. 90–94.

The ore-processing practices of Airlite Processing Corp., Scottsburg, Ind.,[55] and Carr-Lite, Inc., Lake Zurich, Ill.,[56] were also described.

The Perlite Institute, a trade association composed of 37 members of the industry, held 2 meetings during the year. Results of research into various phases of perlite production, standardization, and utilization were presented and discussed. An official seal adopted by the institute may be used on the bags of perlite produced by member firms to indicate compliance with Institute specifications.

The mine value of crude perlite (crushed and sized) averaged $6.39 per short ton in 1950, while the average value of expanded material in bags at the plant was $54.52 per short ton.

Disposal of furnace fines continued to be a problem for many processors as they sought market outlets large enough to absorb the production of that fraction. Major uses for fines at present are as trowel and brush finishes, fillers, air entraining agents, and abrasives.

It has been estimated that 80 percent of the expanded material produced is used as a lightweight plaster aggregate. It is also used in poured-concrete roof decks and floors and in concrete beams, slabs, and blocks as a substitute for heavier aggregates, permitting a savings in structural steel requirements. Miscellaneous applications include: Loose fill, filtration medium, stucco, refractory brick, drill-mud component, roofing tile, soil reconditioner, as a filler and extender, and for numerous lesser special purposes that utilize its light weight, insulating characteristics, inertness, or other physical qualities.

RADIO-GRADE QUARTZ

Imports of quartz crystal continued at virtually the same rate as in the previous year, with an increase noted near the end of the year. Consumption of radio-grade quartz and production of piezoelectric units increased sharply. This increase was largely attributable to military orders late in the year as the Nation's defense program got under way.

As for many years past, the bulk of supplies came from Brazil, with small quantities coming from Hong Kong, India, and France. The imports from Hong Kong and France probably originated in Formosa and Madagascar, respectively. Domestic production of radio-grade quartz crystal is practically nil.

A sharp reduction in the number of finished units produced per pound of quartz consumed was noted. This is largely accounted for by stricter military specifications and new types of units ordered. Another noteworthy trend is utilization of smaller crystals, mostly ranging from 100 to 200 grams and even less. This is also reflected in the average price of imported crystals. The average price during 1949 was roughly $4.50 per pound, whereas the average price in 1950 was about $2.50 per pound. Although prices were reduced somewhat during the year, this reduction would not account for all of the decrease in average price.

---

55 Rock Products, Expanding Perlite in Vertical Furnace: vol. 53, No. 5, May 1950, pp. 91-92.
56 Rock Products, Expansion of Perlite Ore in Stationary Kiln: vol. 53, No. 7, July 1950, pp. 68-69.

TABLE 16.—Imports of uncut quartz crystal, consumption of radio-grade quartz, and production of piezoelectric units in the United States, 1946–50

Year	Imports of uncut quartz crystal [1]		Consumption of radio-grade quartz (pounds)	Production of piezoelectric units [2] (number)
	Pounds	Value		
1946	370,556	$2,376,598	172,400	1,744,100
1947	473,788	1,815,468	68,100	1,052,400
1948	1,238,820	4,209,531	61,600	1,225,400
1949	[3] 319,631	1,462,018	46,200	937,100
1950	310,251	791,412	114,300	1,614,000

[1] Includes optical-grade quartz used in production of optical instruments.
[2] Includes oscillators, resonators, and other piezoelectric units.
[3] Revised figure.

As a safeguard against interruptions of delivery of Brazilian quartz crystal and possible lack of reserves, the program of synthesizing quartz was continued during the year under the guidance of the Signal Corps. Two firms, Brush Development Co., Cleveland, Ohio, and Bell Telephone Laboratories, Inc., Murray Hill, N. J., are engaged in actual laboratory synthesis of radio-grade quartz. Crystals of over 500 grams weight and excellent quality have been produced. The Signal Corps has also contracted with many other firms, colleges, and research organizations for supporting types of research and investigation projects.

The current interest in high-frequency communication equipment has created a demand for very thin quartz-crystal oscillator plates. The equipment and procedure for manufacturing these plates were described in some detail in an article.[57]

It was reported that two large deposits of quartz crystal were discovered at Pium and Piaus, Goias State, in Brazil, and that these finds were attracting considerable interest.[58]

STRONTIUM MINERALS

No domestic production of strontium minerals has been reported, except for sample lots, since 1946. During the war years a considerable quantity of low-grade celestite was produced in Brown and Nolan Counties, Tex., and used principally as a substitute for barite in well-drilling muds. However, after the patent on the use of barite in well-drilling muds expired in 1943, payment of royalties was no longer necessary, and as soon as barite became plentiful at the end of World War II, production of celestite from this source was discontinued.

Manufacturers Minerals Co., Seattle, Wash., planned to explore and develop a celestite deposit on Fidalgo Island in Puget Sound, with production anticipated in 1951.

The principal consumers of celestite in the United States are: E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and Foote Mineral Co., Philadelphia, Pa.

[57] Sogn, L. T., and Howard, W. J., The Mechanical Production of Very Thin Oscillator Plates: Jour. Research Nat. Bureau of Standards, vol. 43, November 1949, (Research Paper 2037).
[58] Mining World, vol. 12, No. 11, October 1950, p. 53.

All celestite received during 1950 was imported from the United Kingdom and Mexico. Shipments from Spain ceased in the previous year, when a preclusive buying agreement with that country was fulfilled.

The principal uses for strontium compounds are in red-flame pyrotechnic compositions, such as truck signal flares and railroad "fusees," tracer bullets, and military signal flares.

TABLE 17.—Strontium minerals [1] imported for consumption in the United States, 1948–50, by countries, in short tons

[U. S. Department of Commerce]

Country	1948		1949		1950	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada-Newfoundland			59	$788		
Mexico	1,114	$14,963	1,158	14,690	1,975	$23,910
Spain	14,614	440,318	3,263	74,829		
United Kingdom	6,043	103,428	4,904	86,378	6,655	118,303
Total	21,771	558,709	9,384	176,685	8,630	142,213

[1] Strontianite or mineral strontium carbonate and celestite or mineral strontium sulfate.

The occurrence of a typical deposit of celestite near Bellwood, Pa., as well as other deposits in this area, has been described.[59]

In addition to the previously reported deposit of celestite in the Trichinopoly District in India and the Mianwali District, Punjab, another deposit has been reported in Pakistan near Karachi. No estimate of the reserves in this deposit is available.[60]

At the end of the year trade-journal quotations of prices for celestite, in car lots, 92 percent $SrSO_4$, finely powdered, was unchanged at $54 per ton. Crude, 90 percent grade, f. o. b. cars California, was unchanged at $19. Strontianite, lump in car lots, minimum 84 to 86 percent, $SrCO_3$, was unchanged at $55 per ton. These prices are nominal.

TOPAZ

No production of topaz was reported to the Bureau of Mines during 1950. The Brewer mine near Kershaw, S. C., and the deposit near Naples, N. C., formerly worked by the Carolina Mining & Exploration Co., apparently were inactive during the year.

VERMICULITE

Production.—Sales of screened and cleaned vermiculite produced in the United States continued to gain and in 1950 were 208,096 short tons valued at $2,122,427, representing an increase of 23 percent in quantity and 26 percent in value over the preceding year.

Production in 1950 was reported by the following companies: Zonolite Co., 135 South LaSalle St., Chicago, Ill. (mines at Libby,

[59] Hamilton, Howard V., Notes of the Occurrence of Celestite in Pennsylvania: Rocks and Minerals, vol. 25, Nos. 7–8, July–August 1950, pp. 348–350.

[60] Bureau of Mines, Mineral Trade Notes: vol. 31, No. 4, October 1950, p. 32.

Mont., and Travelers Rest, S. C.); American Vermiculite Co., Spruce Pine, N. C. (mine near Spruce Pine, N. C.); Mikolite Sales Corp., Kansas City, Mo. (mine near Encampment, Wyo.); Vermiculite Supplies, Inc., Sylva, N. C. (mine near Sylva, N. C.); The Variegate Vermiculite Co., Greenmountain, N. C. (mine near Forbes, N. C.); and Colorado Vermiculite Co., Colorado Springs, Colo. (mine near Westcliffe, Colo.).

Miners and processors of vermiculite have formed the Vermiculite Association, Inc., to increase and diffuse the knowledge and uses of vermiculite in widely diversified fields. Standard specifications for both crude ore and expanded products are being developed.[61]

TABLE 18.—Screened and cleaned vermiculite sold or used by producers in the United States, 1943–50

Year	Short tons	Value	Year	Short tons	Value
1943	46,645	$471,595	1947	131,385	$1,338,572
1944	54,116	541,744	1948	138,635	1,387,233
1945	64,808	648,077	1949	168,819	1,686,419
1946	86,390	867,973	1950	208,096	2,122,427

Assuming an average price of $80 a ton for exfoliated material and a 5-percent loss in weight in the exfoliating process, the value of exfoliated vermiculite sold in the United States during 1950 would be about 16 million dollars.

Uses.—Since vermiculite entered the commercial market some 25 years ago, the variety of uses to which it may be put has steadily increased. In the main the uses are based on the structure and lightness of the aggregates of exfoliated grains. Among its many uses are: Aggregate for plaster and concrete, insulation, soundproofing, refractories, stucco, safe and vault linings, wallboard, filters, plastic products, rubber goods, and as an extender for paints. Recently increased attention has been paid to the use of vermiculite for agricultural purposes as a soil conditioner.[62]

A portable expanding furnace for vermiculite has been developed for situations where large operations are not justified. The furnace will make it possible to process vermiculite on the site at construction projects.[63]

The resilience of studless 2-inch solid vermiculite-plaster partitions was established in recent impact tests.[64]

Use of vermiculite as a refractory is beginning to attract wider interest, both as brick and in a variety of moulded shapes.[65]

Prices.—Domestic screened and cleaned vermiculite in 1950 averaged $10.20 a short ton, f. o. b. mines, while quotations of South African crude were $30 to $32 a short ton, c. i. f. Atlantic ports. The wholesale price of exfoliated material was about $80 a short ton during 1950.

61 Concrete, vol. 58, No. 12, December 1950, p. 14.
62 Saunder, D. H., Value of Vermiculite in Agriculture and Horticulture: Rhodesian Tobacco Jour. (Salisbury, Southern Rhodesia), January 1951, pp. 61–67.
63 Rock Products, vol. 53, No. 2, February 1950, p. 84.
64 Pit and Quarry, vol. 43, No. 3, October 1950, p. 125.
65 Refractories Journal, February 1950, pp. 36–39.

Africa.—Sales of vermiculite in the Union of South Africa during 1950 were 31,497 short tons, an increase of 35 percent over the preceding year. Of this amount, 16,531 short tons were exported to the United States, with a total f. o. b. export value of £S. A. 91,483, or about $15.49 a short ton.

The Department of Mines of the Union of South Africa has made an extensive study of a vermiculite deposit in northeast Transvaal and reports the existence of one deposit, with over 5 million tons of vermiculite of commercial grade. Other deposits have been located in the Petersburg and Zoutpansberg districts. Numerous tests carried out by the Geology Department of Witwatersrand University and by the Government Metallurgical Laboratory indicate that the hydrophlogopite type of vermiculite occurring in South Africa has an extension factor ranging from 21 to 30.[66]

At several places in Southern Rhodesia vermiculite deposits are known, and some production has been reported. Occurrences are also noted in Nyasaland.

Other Occurrences.—Vermiculite deposits are reported in the State of Mysore in India.

The vermiculite deposits near Liberdade, State of Minas Gerais, Brazil, have produced some material for local use.

A discovery of vermiculite at Stanleyville, near Perth, Ontario, has been announced by the Hon. James J. McCann, Minister of Mines and Surveys, Ottawa. The mineral varies in grade from place to place over a large area, and considerable development work will be necessary before the full potentialities are known.[67]

An occurrence of vermiculite in Queensland, Australia, has been reported, and further prospecting of the deposit is recommended by by the Queensland Geological Survey.[68]

WOLLASTONITE

The only deposit of wollastonite being worked in the United States today is at Bristol Mountain near Willsboro, N. Y. From this deposit the Willsboro Mining Co. produced approximately 2,500 short tons during 1950. This material was valued at $20 per ton, f. o. b. the shipping point. Sales were for use principally in ceramics and as a chemical raw material. A considerable amount of research into probable uses of this material has recently been carried on. These potential uses include electrical insulators, paint extender, paper filler, industrial and building tile, and many others.

---

[66] Department of Mines, Union of South Africa, Quarterly Information Circular, October to Decembe 1950, pp. 41–57.

[67] Northern Miner (Toronto, Ontario), vol. 36, No. 35, Nov. 23, 1950, p. 23.

[68] Queensland Government Mining Jour., vol. 51, No. 581, Mar. 20, 1951, p. 168.

PART III. STATE REVIEWS

The Mineral Industry of Alaska

By Alfred L. Ransome and William H. Kerns

GENERAL SUMMARY

GOLD output in Alaska in 1950, following a 2-year decline, increased to the highest point since 1942. This unexpected gain in production of the Territory's greatest value commodity was largely responsible for the increase in the over-all value of mineral output in the Territory to $17,852,000 from $15,549,000 in 1949. Although coal continued to rank second to gold in value of output, production was slightly less than the record production of 1949. The mining of platinum continued to be an important factor in the mineral industry, with production of crude platinum metals exceeding that of 1949. The output of lead was three times the 1949 production, and silver gained 46 percent over the previous year's total. Copper and zinc production—entirely as byproducts from other ores—showed an increase, but remained minor. Production of tin was relatively small, but substantially above the total for 1949.

TABLE 1.—Mineral production of Alaska, 1948–50

Mineral	1948		1949		1950	
	Quantity	Value	Quantity	Value	Quantity	Value
Antimony ore____short tons__	68	$29,336	74	$31,356	----------	----------
Coal, bituminous____do____	407,906	2,789,275	433,533	3,309,303	[1] 412,455	[1] $3,033,445
Copper____do____	16	6,944	4	1,576	6	2,496
Gold____troy ounces__	248,395	8,693,825	229,416	8,029,560	289,272	10,124,520
Lead____short tons__	329	117,782	51	16,116	149	40,230
Mercury____flasks (76 pounds)__	100	7,649	100	7,946	----------	----------
Sand and gravel____short tons__	(2)	(2)	(2)	(2)	3,050,020	2,377,407
Silver____troy ounces__	67,341	60,947	36,056	32,633	52,638	47,640
Stone____short tons__	40,730	54,637	(2)	(2)	(2)	(2)
Tin (Sn content)____do____	5	(2)	57	114,800	89	170,281
Tungsten (60-percent concentrates) (shipments)____short tons__	----------	----------	----------	----------	13	(2)
Zinc____do____	22	5,852	2	496	6	1.704
Undistributed [3]____	----------	1,257,704	----------	4,005,086	----------	2,054,735
Total____	----------	13,024,000	----------	15,549,000	----------	17,852,000

[1] Final figure. Supersedes preliminary figure given in commodity chapter.
[2] Value included with "Undistributed."
[3] Comprises value of clay and pumice (1948), platinum-group metals, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).

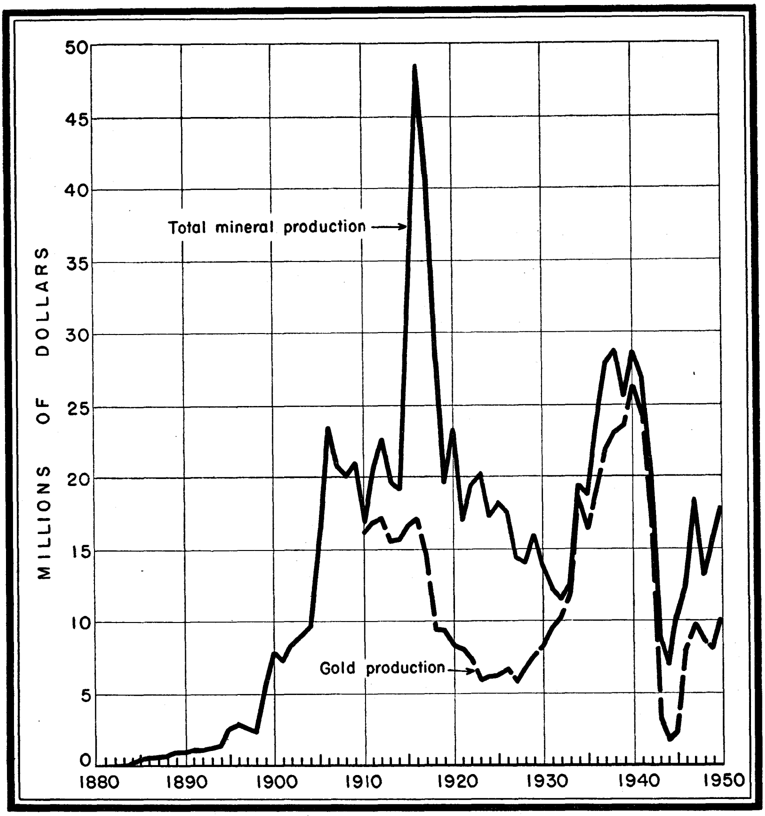

FIGURE 1.—Value of total mineral production (1880–1950) and gold production (1910–50) in Alaska. From 1911 to 1931 copper production accounted for most of the value of minerals other than gold.

Up to the present gold mining has maintained its position as the backbone of the mining industry in Alaska; however, the ever-increasing difficulty of balancing high costs of mining, labor, and supplies against the established United States Treasury price of $35 per fine ounce for gold makes questionable the future of this industry as the leader in value of production. The surprising advance in output for 1950 that occurred despite these difficulties was achieved by a smaller number of men, employed by eight fewer mining operations, than in 1949. Were it not for the greater efficiency of the relatively few larger-scale operations utilizing mechanical equipment—particularly bucket-line dredges—production would probably have been lower than in 1949, since an unusually dry season in the Territory resulted in a cessation of activity at a number of placer operations in several districts in the Yukon River Basin and Seward Peninsula regions. "Natural" or unprocessed gold continued to be legally sold on the open market at prices varying from $3 to $5 over the official price, but this phase of activity was considerably less than in 1949.

Lode mining in the Territory continued to remain virtually at a standstill; and, with the exception of coal, and sand and gravel, nonmetalliferous activity was negligible.

GOLD, SILVER, COPPER, LEAD, AND ZINC

Data on mine production of gold, silver, copper, lead, and zinc in Alaska, 1946-50, and 1880-1950, in terms of recoverable metal; the gold production at placer mines, by classes of mines and methods of recovery; mine production of gold, silver, copper, lead, and zinc, by regions; and ore and old tailings sold or treated, as well as various metallurgical compilations based on output in 1950, are shown in tables 2 to 11, inclusive.

A small proportion of the output recorded as having been produced in 1950 was mined in a former year but not shipped or sold until 1950.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

Yardage figures used in measuring material treated in placer operations represent "bank measure"; that is, the material is measured in the ground before treatment. Close control of bank measure is kept by operators of bucket-line dredges, but the quantity of material handled by other placer-mining methods in Alaska is largely estimated by the individual operators on the basis of square feet of bedrock area worked and the average depth of the gravel.

The value of gold, silver, copper, lead, and zinc production reported herein has been calculated at the prices shown in table 2.

TABLE 2.—Prices of gold, silver, copper, lead, and zinc, 1946-50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948-50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by Office of Metals Reserve for overquota production.

Gold.—The recorded production of gold in Alaska in 1950, which was 26 percent above that in 1949, marked a decided reversal of the trend of the past 2 years. This surprising gain was accomplished despite the fact that a smaller number of men was employed at 11 lode and 216 placer operations as compared to 18 and 223, respectively, in 1949. An unusually dry season in the Territory resulted in cessation of activity at a number of operations and curtailment at others in several districts in the Yukon River Basin and Seward Peninsula regions. Adverse economic conditions, including higher-than-ever costs for supplies and equipment, continued to harass the industry, and high wages offered by contractors connected with defense projects in areas adjacent to mines virtually eliminated the gold-mine operators from competition in the labor market. The gain in gold output was the result of increased production from a few larger operations, particularly those using bucket-line dredges, and to an over-all greater efficiency in labor and equipment at many of the operations using mechanical methods of placer mining. That the industry has survived—and even advanced in quantity of output—in the face of such obstacles, with an unchanged established price of $35 per fine ounce for the product, is remarkable. There is a penalty for current survival, however, which is not immediately apparent. In order to stay in business, it has been necessary to mine selectively the higher-grade deposits, with the result that the marginal zones—which together total millions of dollars in potential gold reserves—probably will never be worked.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in Alaska, 1946–50, and total, 1880–1950, in terms of recoverable metal [1]

Year	Lode mines [2]		Placer mines [2]		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	16	10,798	256	14,108,000	226,781	$7,937,335	41,793	$33,769
1947	19	13,891	260	13,866,000	279,988	9,799,580	66,150	59,866
1948	24	6,014	274	16,744,000	248,395	8,693,825	67,341	60,947
1949	18	78,839	[3] 223	18,363,000	229,416	8,029,560	36,056	32,633
1950	11	58,668	216	17,621,000	289,272	10,124,520	52,638	47,640
1880–1950	----------	(4)	----------	(4)	27,130,499	662,582,067	20,012,483	14,282,677

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	2	$648	115	$25,070	----------	----------	$7,996,822
1947	12	5,040	264	76,032	25	$6,050	9,946,568
1948	16	6,944	329	117,782	22	5,852	8,885,350
1949	4	1,576	51	16,116	2	496	8,080,381
1950	6	2,496	149	40,230	6	1,704	10,216,590
1880–1950	685,904	226,579,920	25,719	3,024,793	55	14,102	906,483,559

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore and old tailings shipped directly to smelters during the calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Revised.
[4] Figures not available.

The sale of unprocessed or natural gold by a few operators who hoped to gain by open-market transactions at prices exceeding $35 per fine ounce apparently was considerably less in volume than in 1949. The recorded production for 1950 includes 5,461 fine ounces of gold contained in natural gold sold on the open market by two producers. In addition, 394 ounces of natural gold in the form of nuggets, grains, and dust were reported sold by three producers on the open market for prices equivalent to $35 or more per fine ounce of gold contained therein; information on fineness was inadequate for calculating the recoverable gold and silver content for inclusion with the 1950 statistical record. Available information indicates that an undetermined quantity of natural gold was sold by several producers who did not report specifically, and 791 ounces of natural gold from one property was reported produced but not sold. An undetermined but substantial quantity of gold (at least several hundred and possibly several thousand ounces) reported sold in 1950—and recorded statistically in the record for the year—was undoubtedly produced in 1949, and disposed of as natural gold, or held speculatively and subsequently sold through the normal channels to the United States mints at the established United States Treasury price. Specific and accurate data regarding natural gold sales are not readily available, and the aforementioned figures giving the number of operators and quantities involved are incomplete. However, it can be assumed from these data that natural gold originating from Alaskan mines and sold in 1950 was substantially less than the estimated 22,000 ounces sold in 1949—and the latter may itself be an overestimate.

TABLE 4.—Fifteen leading gold-producing mines in Alaska in 1950, in order of output [1]

Rank	Mine	District	Region	Rank in 1949	Operator	Source of gold
1	Fairbanks unit	Fairbanks	Yukon River Basin.	1	United States Smelting, Refining & Mining Co.	Dredge.
2	Nome unit	Nome	Seward Peninsula	2	do	Do.
3	New York-Alaska Gold Dredging Corp.	Tuluksak-Aniak.	Kuskokwim	3	New York-Alaska Gold Dredging Corp.	Do.
4	Brinker-Johnson Co.	Fairbanks	Yukon River Basin.	4	Brinker-Johnson Co.	Do.
5	Independence	Willow Creek	Cook Inlet-Susitna.	14	Alaska-Pacific Consolidated Mining Co.	Gold ore.
6	C. J. Berry Dredging Co.	Circle	Yukon River Basin.	8	C. J. Berry Dredging Co.	Dredge.
7	Casa de Paga Gold Co.	Fairhaven	Seward Peninsula	11	Casa de Paga Gold Co.	Do.
8	Innoko Dredging Co.	Innoko	Yukon River Basin.	(2)	Innoko Dredging Co.	Do.
9	Strandberg & Sons	Hughes	do	5	Strandberg & Sons	Placer.
10	Alder Creek Mining Co.	Fairbanks	do	10	Alder Creek Mining Co.	Do.
11	Gold Placers, Inc.	Circle	do	(2)	Gold Placers, Inc.	Dredge.
12	Colorado Creek Mining Co.	Innoko	do	(2)	Colorado Creek Mining Co.	Placer.
13	Myrtle Creek Mining Co.	Koyukuk	do	44	Myrtle Creek Mining Co.	Do.
14	North American Dredging Co.	Iditarod	do	6	North American Dredging Co.	Dredge.
15	Rosander & Reed	Innoko	do	[3] 119	Rosander & Reed	Placer.

[1] Based on known output, including "Natural" gold sales in cases where fine gold content was calculable.
[2] Did not produce in 1949.
[3] Rank in 1949 was actually higher than shown because of natural gold sold, but not included statistically with recorded production.

The unusual seasonal limitations on mining activity in Alaska are indicated by the production of gold in 1950 by months, as shown in table 6. The data are based on mint and smelter receipts, which have been adjusted to exclude 6,304 fine ounces of gold received during the first 4 months previously credited to 1949 production, and to include 3,247 ounces received during the same period in 1951 but actually produced in 1950. Production was probably considerably less than the shipments shown for the last 3 months of the year but correspondingly higher for May through September, the season for active mining in the Territory between the spring breakup or thaw and the fall freeze. The principal reason for the relatively high receipts at mints and smelters during the last quarter is that numerous operators make their gold "clean-up" only once or twice during the active mining season, the result being that a substantial quantity of gold accumulated in the sluices, over a period of several months, is not recovered until late fall and often not reported as receipts at the mint or smelter until the following spring.

TABLE 5.—Gold produced at placer mines in Alaska, 1946–50, by class of mine and by method of recovery

Class and method	Mines producing [1]	Washing plants	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucket-line dredges:						
1946	20	26	9,810,000	149,382	$5,228,370	$0.533
1947	22	28	8,395,000	188,800	6,608,000	.787
1948 [2]	23	31	11,300,000	171,161	5,990,635	.530
1949 [2]	21	29	14,663,000	157,306	5,505,710	.375
1950	20	28	12,557,000	205,641	7,197,435	.573
Dragline dredges:						
1946	1	1	65,000	2,713	94,955	1.461
1947	2	2	148,000	3,715	130,025	.879
1948–50						
Nonfloating washing plants: [3]						
1946	66	66	2,091,000	37,519	1,313,165	.628
1947	75	75	2,905,000	45,990	1,609,650	.554
1948 [2]	106	106	4,170,000	56,076	1,962,660	.471
1949 [2]	117	117	3,392,000	57,979	2,029,265	.598
1950	116	116	4,908,500	68,199	2,386,965	.486
Gravel hydraulically handled:						
Hydraulic:						
1946	116		2,123,000	30,390	1,063,650	.501
1947	114		2,371,000	36,769	1,286,915	.543
1948	82		1,220,000	14,493	507,255	.416
1949	33		252,500	5,087	178,045	.705
1950	24		135,300	2,097	73,395	.542
Small-scale hand methods:						
Wet:						
1946	51		18,800	688	24,080	1.281
1947	44		46,600	1,121	39,235	.842
1948	59		53,300	984	34,440	.646
1949	50		55,330	693	24,255	.438
1950	50		18,000	905	31,675	1.760
Underground placers:						
Drift:						
1946	2		200	16	560	2.800
1947	3		400	48	1,680	4.200
1948	4		700	88	3,080	4.400
1949	2		170	24	840	4.941
1950	6		2,200	269	9,415	4.280
Grand total placers:						
1946	256		14,108,000	220,708	7,724,780	.548
1947	260		13,866,000	276,443	9,675,505	.698
1948	274		16,744,000	242,802	8,498,070	.508
1949	223		18,363,000	221,089	7,738,115	.421
1950	216		17,621,000	277,111	9,698,885	.550

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Data for 1948–49 revised owing to reclassification of one mine based on additional information received.
[3] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."

The 15 leading gold-producing mines (14 placer and 1 lode) in Alaska in 1950, listed in table 4, yielded 76 percent of the total recorded gold output of the Territory; the 5 leading producers supplied 62 percent. The Fairbanks district in the Yukon River Basin region and the Nome district in the Seward Peninsula region ranked first and second, respectively, in gold production in the Territory because of the bucket-line dredging operations of the United States Smelting, Refining & Mining Co.

Activity at lode mines in interior Alaska was limited largely to a few operations in the Willow Creek district, the principal producer being the Alaska-Pacific Consolidated Mining Co., which worked the Independence mine. In Southeastern Alaska the LeRoy Mining Co. was active during the season, and the Hirst-Chichagof mine on Chichagof Island resumed limited operations in 1950 following a period of inactivity since October 15, 1942. A substantial quantity of gold was recovered by reworking old tailings and by mill clean-ups at the Alaska Juneau, Thane, and Treadwell mills on Gastineau Channel, and the Chichagof mill and old tailings pile on Chichagof Island.

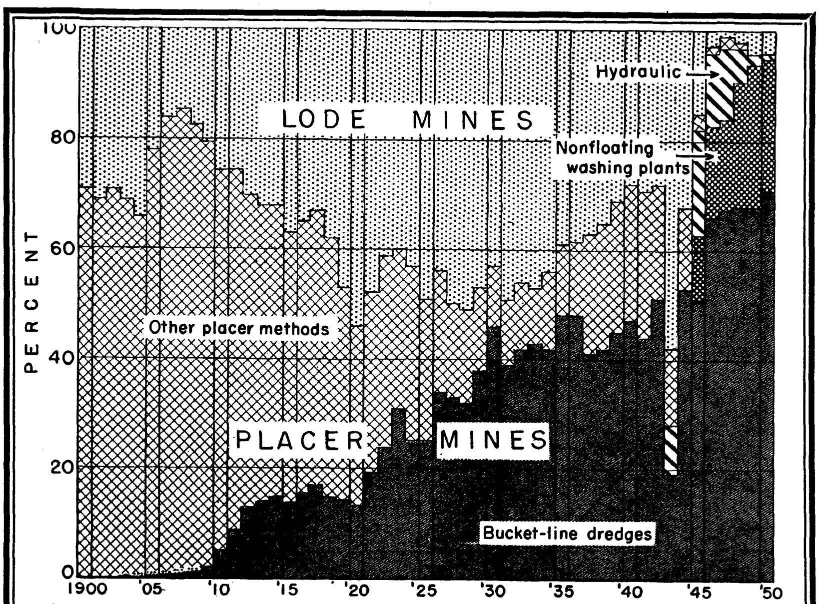

FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900–50; "other placer methods" include hydraulic and nonfloating washing plants, for which separate data are not available prior to 1943.

Silver.—The 52,638 fine ounces of silver produced in 1950 (a 46-percent increase over 1949) was largely the byproduct of gold mining (76 percent) and of lead ore (24 percent). The most-important producer of silver in Alaska in 1950 was the United States Smelting, Refining & Mining Co., which recovered silver as a byproduct of bucket-line dredging operations in the Fairbanks and Nome districts. E. M. Thompson, who operated the Riverside mine, Hyder district, Southeastern Alaska, under lease from J. H. Scott Co. during 1950, recovered silver as a byproduct from lead ore produced.

Copper, Lead, and Zinc.—Again as in 1949, production of base metals (copper, lead, and zinc) was limited almost entirely to output from one mine, the Riverside, near Hyder in Southeastern Alaska. A relatively small output of the metals came from several other properties in the region as byproduct recovery from ore and old tailings treated primarily for the recovery of gold.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by months, in terms of recoverable metal [1]

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	487	34			
February	889	55			
March	1,079	65			
April	1,457	151			
May	9,056	2,611	1	12	1
June	13,995	3,306	1	18	1
July	26,257	5,465	1	25	1
August	45,096	8,297	1	30	1
September	61,321	11,522	1	30	1
October	51,698	9,353	1	25	1
November	43,167	7,219		9	
December	34,770	4,560			
Total: 1950	289,272	52,638	6	149	6
1949	229,416	36,056	4	51	2

[1] Derived mostly from mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1950 previously credited to 1949 production, and to include receipts in 1951 which are a part of actual output in 1950.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by regions, in terms of recoverable metal

Region	Mines producing [1]		Gold (fine ounces)			Silver (lode and placer, fine ounces)	Total value
	Lode	Placer	Lode	Placer	Total		
Cook Inlet-Susitna	3	11	8,701	2,857	11,558	1,084	$405,511
Copper River		6		1,610	1,610	181	56,514
Kenai Peninsula and Kuskokwim [2]	1	12	42	21,886	21,928	1,756	769,069
Northwestern Alaska		3		1,216	1,216	96	42,647
Seward Peninsula		64		66,631	66,631	7,417	2,338,798
Southeastern Alaska	5		3,103		3,103	13,429	[3] 165,189
Yukon River Basin	2	120	315	182,911	183,226	28,675	6,438,862
Total Alaska: 1950	11	216	12,161	277,111	289,272	52,638	[3] 10,216,590
1949	18	[4] 223	8,327	221,089	229,416	36,056	[5] 8,080,381

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Combined to avoid disclosure of individual output.
[3] Includes value of 6 short tons of copper ($2,496), 149 tons of lead ($40,230), and 6 tons of zinc ($1,704).
[4] Revised.
[5] Includes value of 4 short tons of copper ($1,576), 51 tons of lead ($16,116), and 2 tons of zinc ($496).

MINING INDUSTRY

Bucket-line dredges (28 in 1950 compared with a revised figure of 29 for 1949) washed 71 percent of the total gravel mined for gold in Alaska in 1950 and recovered 74 percent of the total placer gold and 71 percent of the total Alaska gold (lode and placer). Placer mining accounted for 96 percent of the total gold produced in Alaska in 1950 (the same as in 1949). No dragline dredges (operations using a floating washing plant and a dragline excavator) were reported in operation during 1950. However, several so-called "dry-land dredges" (operations using a power excavator and movable mechanical washing plant, both of which are on dry land) were operated at widely separated localities in the Territory during the year.

Placer operations using combinations of bulldozer and hydraulic methods—in many cases supplemented with dragline equipment—continue to become more widespread in the Territory because of the distinct advantage of relatively low initial cost of equipment in proportion to the small labor crews necessary and the large volume of material that can be handled. In general, the mining method is to bulldoze the gold-bearing material to sluice boxes (the latest successful innovation is the use of a sluice plate at the head of the sluice box on which the gravel is dumped or pushed) and to employ hydraulic giants to wash the gravel through (frequently in closed circuit with a settling pond downstream below the sluice box and a pump for the return of the water). Dragline equipment—when used—is generally utilized for disposing of tailings, and in some cases for transporting gravel to elevated sluice boxes or washing plants. Occasionally, draglines, or bulldozers are used for removing overburden, but by far the greatest proportion of the overburden, in the form of frozen "muck," is washed off with hydraulic giants. A new tool—the automatic hydraulic giant—has been developed and found particularly useful in certain areas for disposing of frozen overburden.

Combination methods of placer mining, in which the gravel is moved by mechanical means to the washing plant or sluice box (classified as nonfloating washing plants), washed 28 percent of the total gravel mined and recovered 25 percent of the placer gold, a 45-percent increase in gravel handled and an 18-percent gain in gold recovered compared with 1949. Operations in which gold was recovered primarily by hydraulic methods (excluding hydraulic stripping of overburden) again showed a decrease in the number of mines (partly because of reclassification from hydraulic to nonfloating washing plants), gravel washed, and gold produced.

Gold output from a greater number of small-scale hand operations was correspondingly higher than in 1949. Six drift mines produced only a small quantity of gold in 1950; this method of mining, once widespread in Alaska, is now virtually obsolete, being supplanted by the more efficient mechanical methods that are better-adapted to working deeper lower-grade gravels.

The total yardage of gravel washed at gold placer mines decreased 4 percent, whereas gold recovered was 25 percent higher. The average recoverable gold content of gravel increased 31 percent.

The tonnage of material from lode mines (gold, silver, copper, lead, and zinc) in Alaska treated in 1950 was 26 percent less than in 1949. Although the output of lode gold increased 46 percent, the quantity recovered from all active lode mines and from mill clean-ups and tailings re-treatment at inactive mines comprised only 4 percent of all gold produced in the Territory (lode and placer). Economically, conditions in 1950 did not favor lode-gold mining, and 60 percent of the total lode gold produced in 1950 came from one mine, the Independence, in the Willow Creek district, Cook Inlet-Susitna region. The only base-metal mine in operation during the year was the Riverside, a lead-tungsten property near Hyder in Southeastern Alaska. Positive results of the provisions of the Defense Production Act of 1950 with respect to strategic metal mining in Alaska had not become apparent by the end of 1950.

ORE CLASSIFICATION

Of the 58,668 tons of ore (including 44,394 tons of old tailings) sold or treated in 1950, 94 percent was gold ore and the remainder lead ore. Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines	Material sold or treated		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
		Ore (short tons)	Old tailings (short tons)					
Dry gold ore	10	10,774	44,394	11,805	1,423			
Lead ore	1	3,500		356	12,700	12,000	298,000	12.000
Total lode mines	11	14,274	44,394	12,161	14,123	12,000	298,000	12,000
Gravel (placer operations)	216			277,111	38,515			
Total: 1950	227	14,274	44,394	289,272	52,638	12,000	298,000	12,000
1949	241	8,813	70,026	229,416	36,056	8,000	102,000	4,000

METALLURGICAL INDUSTRY

All of the ore and old tailings processed during 1950 was treated at mills (with or without concentrating equipment); no ore was shipped for direct smelting. Of the lode gold produced, 82 percent was recovered by amalgamation. Smelters in the United States received 1,703 tons of flotation concentrates and 465 tons of gravity concentrates for smelting from Alaska mines producing gold and lead (with silver, copper, and zinc as byproducts).

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	277,111	38,515			
Amalgamation	9,993	1,011			
Smelting of concentrate:					
Flotation concentrate	1,703	12,912	12,000	298,000	12,000
Gravity concentrate	465	200			
Total: 1950	289,272	52,638	12,000	298,000	12,000
1949	229,416	36,056	8,000	102,000	4,000

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

	Material treated		Recoverable in bullion		Concentrate shipped to smelters [1] and recoverable metal					
	Ore (short tons)	Old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY REGIONS										
Cook Inlet-Susitna	10,270	-------	7,425	465	208	1,276	166	---------	---------	---------
Kenai Peninsula and Kuskokwim [2]	55	-------	42	11	-------	--------	--------	---------	---------	---------
Southeastern Alaska	3,749	44,394	2,211	483	456	892	12,946	12,000	298,000	12,000
Yukon River Basin	200	-------	315	52	-------	--------	--------	---------	---------	---------
Total: 1950	14,274	44,394	9,993	1,011	664	2,168	13,112	12,000	298,000	12,000
1949	8,799	70,026	7,131	851	386	1,130	4,145	8,000	102,000	4,000
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS										
Dry gold					254	1,812	412	---------	---------	---------
Lead					410	356	12,700	12,000	298,000	12,000
Total 1950					664	2,168	13,112	12,000	298,000	12,000

[1] No crude ore shipped to smelters.
[2] Combined to avoid disclosure of individual output.

TABLE 11.—Gross metal content of concentrates produced from ores mined in Alaska in 1950, by class of concentrate

Class of concentrate	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold	254	1,812	412	1,663	2,359	-----------
Lead	410	356	12,700	14,668	346,500	17,740
Total: 1950	664	2,168	13,112	16,331	348,859	17,740
1949	386	1,130	4,145	9,131	105,285	4,765

REVIEW BY REGIONS AND DISTRICTS

COOK INLET—SUSITNA REGION

Willow Creek District.—The Alaska Pacific Consolidated Mining Co. operated the Independence mine on Fishhook Creek near Wasilla throughout 1950 and produced 60 percent of the year's total lode-gold output for the Territory; in 1949 the mine was operated on a leasing system. The ore was treated at the company 80-ton amalgamation-flotation mill on the property. From 9,575 tons of gold ore milled, 6,140 ounces of gold and 406 ounces of silver were recovered as bullion by amalgamation; in addition 197 tons of concentrate (containing 1,146 ounces of gold, 159 ounces of silver, and 1,223 pounds of copper) produced by flotation was shipped to a smelter in the

United States. The Fern Exploration Co., Inc., operated the Fern mine on Archangel Creek from February 2 to August 30. The gold ore was treated in a 50-ton amalgamation-flotation mill, and a substantial quantity of gold and some silver were recovered by amalgamation. Flotation concentrate (containing gold, silver, and a small percentage of copper) was shipped to a smelter in the United States. A small quantity of gold and silver was recovered from the Old Married Twins property by Ward Sroufe. The Snowbird Mining Co., Inc., continued its development and construction program at the Snowbird mine on Reed Creek during the year. Units completed by year's end included a mill of modern design, Diesel-electric power plant, and a complete camp. Underground development continued, but no report was received of any ore being treated by December 31.

Yentna-Cache Creek District.—Again, as in 1948 and 1949, the largest producer in the Yentna-Cache Creek district was Collinsville Mines (dry-land dredge with dragline equipment) operating on Mills Creek. The Falls Creek Venture was active in the Falls Creek area; a small quantity of gold and silver was recovered incidental to prospecting on the Carlson claims. The Alaska Exploration & Mining Co. property on Bird Creek was leased to Mike Trepte and Anton Meise, who recovered a moderate quantity of gold and silver by hydraulicking. Philip Brandl operated the Cache Creek property under lease from the Nugget Creek Mining Co. and recovered some gold and silver by hydraulicking. Several other operators recovered sizable quantities of gold by small-scale hand, hydraulic, and bulldozer-hydraulic combinations.

COPPER RIVER REGION

Chistochina District.—Only one property was active in the Chistochina district in 1950. The Mount Kimball Construction Co. operated at the mouth of Slate Creek from May 25 to October 12 under lease from the Slate Creek Mining Co. and recovered a substantial quantity of gold by a hydraulic-bulldozer combination method.

Nelchina District.—C. J. McMahan, reportedly the only operater in the Nelchina district in 1950, recovered a moderate quantity of gold from Albert Creek, using a carry-all-bulldozer combination to deliver gravel to a sluice box.

Nizina District.—Fred Bronniche recovered a small quantity of gold by small-scale hand operation on Slope Creek, and Chititu Mines recovered a moderate quantity of gold by hydraulicking on Rex and Chititu Creeks.

Yakataga District.—Eugene and Harry Cline and B. B. Watson recovered a small quantity of gold from the Yakataga Beach by small-scale hand methods.

KENAI PENINSULA REGION

Moose Pass-Hope District.—The Skeen-Leckner (Falls Creek) mine was operated by the Falls Creek Mining Co. during June, July, and August 1950; a small quantity of gold was recovered from gold ore treated by amalgamation in the 25-ton mill at the mine. Two other operations, both located on Resurrection Creek, each produced a small quantity of gold; H. A. Anderson by hydraulicking and L. E. Brenner by small-scale hand methods.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by regions and districts, in terms of recoverable metal

Region and district	Mines producing[1]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver[2] (lode and placer, fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Cook Inlet-Susitna region:											
Valdez Creek		(3)			(3)	(3)	(3)				(3)
Willow Creek	3		10,270	8,701		8,701	631				$305,106
Yentna-Cache Creek		10			2,838	2,838	450				99,737
Copper River region:											
Chistochina		(3)			(3)	(3)	(3)				(3)
Nelchina		(3)			(3)	(3)	(3)				(3)
Nizina		(3)			(3)	(3)	(3)				(3)
Yakataga		(3)			(3)	(3)	(3)				(3)
Kenai Peninsula region: Moose Pass-Hope	(3)	(3)	(3)	(3)	(3)	(3)	(3)				(3)
Kuskokwim region:											
Goodnews Bay		(3)			(3)	(3)	(3)				(3)
McGrath		(3)	Cleanup	8	(3)	[4] 8	[4] 2				[4] 282
Tuluksak-Aniak		6			18,813	18,813	1,532				659,842
Northwestern Alaska region:											
Kiana		(3)			(3)	(3)	(3)				(3)
Selawik		(3)			(3)	(3)	(3)				(3)
Shungnak		(3)			(3)	(3)	(3)				(3)
Seward Peninsula region:											
Council-Bluff		8			2,280	2,280	244				80,021
Fairhaven		10			7,222	7,222	809				253,502
Kougarok		17			6,136	6,136	611				215,313
Koyuk		6			1,384	1,384	235				48,655
Nome		21			49,448	49,448	5,501				1,735,659
Port Clarence		(3)			(3)	(3)	(3)				(3)
Serpentine River		(3)			(3)	(3)	(3)				(3)
Southeastern Alaska region:											
Chichagof Island	1		537	454		454	114				15,993
Hyder	1		3,500	356		356	12,700	12,000	298,000	12,000	68,384
Juneau (Harris)	2		43,976	2,228		2,228	570				78,496
Ketchikan	(3)		(3)	(3)		(3)	(3)				(3)

For footnotes, see end of table.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in Alaska in 1950, by regions and districts, in terms of recoverable metal—Continued

Region and district	Mines producing [1]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver [2] (lode and placer, fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Yukon River Basin region:											
Bonnifield-Nenana	(3)	(3)	(3)	(3)	(3)	(3)	(3)				(3)
Chandalar		4			602	602	88				$21, 150
Circle		12			13, 005	13, 005	2, 150				457, 121
Eagle		(3)			(3)	(3)	(3)				(3)
Fairbanks	2	21	199	309	116, 628	116, 937	19, 205				4, 110, 176
Fortymile		12			5, 123	5, 123	925				180, 142
Hot Springs		7			1, 281	1, 281	319				45, 124
Hughes		(3)			(3)	(3)	(3)				(3)
Iditarod		11			8, 183	8, 183	1, 275				287, 559
Innoko		13			19, 078	19, 078	2, 723				670, 194
Kaiyuh		(3)			(3)	(3)	(3)				(3)
Kantishna		(3)			(3)	(3)	(3)				(3)
Koyukuk		17			3, 730	3, 730	346				130, 863
Marshall		(3)			(3)	(3)	(3)				(3)
Rampart		6			2, 331	2. 331	157				81, 727
Ruby		6			3, 765	3, 765	734				132, 437
Tolovana		3			1, 731	1, 731	213				60, 778
Undistributed [5]	2	26	186	105	13, 533	13, 638	1, 104				478, 329
Total Alaska	11	216	58, 668	12, 161	277, 111	289, 272	52, 638	12, 000	298, 000	12, 000	10, 216, 590

[1] Excludes itinerant prospectors, "snipers", "high-graders," and others who gave no evidence of legal right to property.
[2] Sources of total as follows: 14,123 ounces from lode mines, and 38,515 from placers.
[3] Included with "Undistributed" to avoid disclosure of individual company operations.
[4] Exclusive of placer output, which is included with "Undistributed."
[5] Includes values and quantities which cannot be shown separately for certain individual districts as indicated in the appropriate column by footnote reference 3.

KUSKOKWIM REGION

Goodnews Bay District.—Using a hydraulic-bulldozer combination on Fox Creek, the Walter G. Culver & Co. recovered 74 ounces of gold and 11 ounces of silver from 2,500 cubic yards of gravel from May 23 to September 1. Gold was recovered as a byproduct from platinum mined by the Goodnews Bay Mining Co. on the Salmon River.

McGrath District.—Strandberg & Sons resumed operation of its floating bucket-line dredge on Candle Creek during 1950; it was the only active placer mine in the McGrath district. Robert Stone and associates did development work at the Eagle Creek lode-gold mine near Medfra during the year. A small quantity of gold was recovered from a mill clean-up at the Nixon Fork mine near Medfra.

Tuluksak-Aniak District.—The New York-Alaska Gold Dredging Corp., the largest gold producer in the Kuskokwim region and the third largest in the Territory in 1950, as in 1949, operated two floating bucket-line dredges on the Tuluksak River. The Marvel Creek Mining Co., using a dragline-bulldozer-hydraulic combination on Marvel Creek, washed 90,000 cubic yards of gravel between April 1 and October 15 to recover 883 ounces of gold and 112 ounces of silver. Using a bulldozer-hydraulic combination with bedrock sluice boxes on Canyon Creek, the Canyon Creek Mining Co. (Jens Kvamme & Sons) washed 2,800 cubic yards of gravel to recover 311 ounces of gold and 38 ounces of silver. The Moore Creek Mining Co., operating with bulldozers on Taylor Creek from May through September, produced a substantial quantity of gold. Russel Schaefer worked on Forty-seven Creek from July 1 to October 1 and recovered a moderate quantity of gold; a bulldozer was used to deliver gravel to sluice boxes. Using a bulldozer-hydraulic combination, Harry Steen recovered a small quantity of gold from Julian Creek between June 20 and July 20.

NORTHWESTERN ALASKA REGION

Kiana District.—Helcolicon Mines, Inc., the only gold producer reported in the district in 1950, operated its floating bucket-line flume-type dredge on Klery Creek during a short season. The equipment was formerly owned and operated by Lammers Exploration Co. Helcolicon Mines, Inc., continued their systematic placer-drilling program on the Salmon River in 1950.

SEWARD PENINSULA REGION

One-quarter of the total Alaska placer-gold output in 1950 came from the Seward Peninsula region. Twelve floating bucket-line dredges were operated in the region during 1950 (2 less than in 1949); in addition, numerous operators used hydraulic giants, bulldozers, and dragline excavators either separately or in combination. No production was reported from any lode-gold mine.

Council-Bluff District.—The two principal gold producers in the Council-Bluff district during 1950 were the Alaska Placer Co., which operated a floating bucket-line dredge on Niukluk River from June 12 to October 10, and the Sourdough Dredging Co., which operated a bucket-line flume-type dredge, equipped with 62 4-cubic-foot buckets on Ophir Creek (777 ounces of gold and 83 ounces of silver were recovered). C. L. Dempsey spent the 1950 season moving his bucket-line dredge to a new location; 18 ounces of gold and 3 ounces of silver were recovered during prospecting on Lower Willow Creek.

Fairhaven District.—The Casa de Paga Gold Co., the largest gold producer in the Fairhaven district in 1950, operated two bucket-line dredges on the Inmachuk River from June 24 to October 18. Overburden was stripped by hydraulic giants and bulldozers, and 313,920 cubic yards of gravel were handled by the dredges to recover 5,510 ounces of gold and 573 ounces of silver. The Havenstrite Mining Co. operated a bucket-line dredge on Mud Creek and two dragline-bulldozer combinations at separate locations on Candle Creek. Other producers of moderate quantities of gold by the bulldozer-hydraulic combination method were Dahl & Bernard Exploration Co. on Bear Creek, Hannum Creek Mining Co. on Hannum Creek, Jump Creek Mines on Jump Creek, and Wallace Porter on Bear Creek (39 ounces of gold and 4 ounces of silver were recovered from 2,778 cubic yards of gravel).

Kougarok District.—Kougarok Consolidated Placers, Inc., was the largest producer in the district in 1950. The company did not operate its bucket-line dredge on the Kougarok River because of a shortage of water. A dragline was used to deliver gravel to elevated sluice boxes and between June 1 and September 15, 10,000 cubic yards was handled to recover 1,133 ounces of gold and 116 ounces of silver. Three bucket-line dredges—each equipped with 2½-cubic-foot buckets—were operated in the district during the season by the Gold Dust Mining Co. on the Kougarok River, the North Fork Dredging Co. on Harris Creek, and Tolbert Scott & Son on Iron Creek (from July 9 to October 5, 200 ounces of gold and 19 ounces of silver were recovered from 35,000 cubic yards of gravel). Atlas Mines (George J. Waldhelm), operating on Atlas Creek with a dragline-bulldozer-hydraulic combination, washed 2,046 cubic yards of gravel from May 20 to October 1 to recover 342 ounces of gold and 26 ounces of silver. Noonan & Whitmore (bulldozer-dragline-elevated flume operation on claim 7 below Johnson's Discovery, Mascot Gulch) produced a substantial quantity of gold. Other producers of a moderate quantity of gold in 1950—all using combinations of dragline-bulldozer-hydraulic equipment—were Grant Mining Co. on Coffee Creek, Macklin Mining Co. on Macklin Creek, Louis Nashenweng & Patrick J. Bliss Co. on Quartz Creek (claim No. 8) Silver Bow Mining Co. (Herb Jenks) on Coffee Creek, Trinity Mining Co. (Kanari & Carey) on Trinity Creek (tributary of Kougarok River), and N. B. Tweet & Sons on the Kougarok River near Mascot Gulch.

Koyuk District.—Baldwin & Moon worked on Sweepstake Creek during the 1950 season and recovered a substantial quantity of gold using bulldozer-hydraulic equipment; it was the only major operation in the district.

Nome District.—The United States Smelting, Refining & Mining Co., operating three of its fleet of four bucket-line dredges in the vicinity of Nome from May 9 to December 5, was the largest producer of gold in the Nome district and Seward Peninsula region and ranked second in the Territory in 1950. The three dredges in operation are electrically powered and equipped with 134, 109, and 78 nine-cubic-foot buckets respectively. Lee Bros. Dredging Co., the second-largest gold producer in the district in 1950, operated one of its two bucket-line dredges on the Solomon River. One other producer of over 100 ounces of gold was the E. W. Quigley bulldozer-hydraulic operation on the Solomon River. The remaining placer-gold production in the district came from small-scale hand and bulldozer-hydraulic operations.

The Big Hurrah lode-gold mine was taken over in 1950 by T. P. Lane, who plans to rework the tailings of previous operations and recover gold by cyanidation. Necessary equipment for such a plant was ordered and received in 1950.

Port Clarence District.—The Northern Tin Co. recovered a small quantity of gold as a byproduct from its tin placer operation on Buck Creek.

Serpentine River District.—George Bodis worked claim 12 above Discovery on Dick Creek from July 1 to October 1. Using bulldozer-hydraulic equipment with a bedrock flume, gold and silver were reported recovered from 6,000 cubic yards of gravel.

SOUTHEASTERN ALASKA REGION

One-fourth of the total Alaska lode-gold output in 1950 came from five operations in the Chichagof Island, Hyder, Juneau, and Ketchikan districts, the Southeastern Alaska region. No gold placers were reported in operation.

Chichagof Island District.—Hayes & Whitely Enterprises recovered 209 ounces of gold and 46 ounces of silver in the form of bullion by re-treating 537 tons of old tailings from the Chichagof mine by amalgamation; in addition, 9 tons of gravity concentrate (containing 188 ounces of gold, 56 ounces of silver, 123 pounds of copper, and 1,132 pounds of lead) was shipped to a smelter in the United States. The Hirst-Chichagof mine at Kimsham Cove resumed limited operation during 1950 following a period of inactivity since October 15, 1942.

Hyder District.—The Riverside mine was operated from April 1 to December 31 by E. M. Thompson (under lease from J. H. Scott Co.), who treated lead ore (containing scheelite) in the combination flotation-gravity concentration mill at the mine. From the 3,500 tons of lead ore which was milled, 410 tons of lead concentrate (containing 356 ounces of gold, 12,700 ounces of silver, 14,668 pounds of copper, 346,500 pounds of lead, and 17,740 pounds of zinc) was produced and shipped to smelters in the United States and Canada.

Juneau District.—The Alaska Juneau mine remained inactive during 1950. Hayes & Whitely Enterprises recovered 1,624 ounces of gold and 302 ounces of silver in the form of bullion by re-treating 43,800 tons of old tailings by amalgamation from the Alaska Juneau mill; in addition 31 tons of gravity concentrate (containing 252 ounces of gold, 102 ounces of silver, 145 pounds of copper, and 765 pounds of lead) was shipped to a smelter in the United States. The LeRoy Mining Co. operated the LeRoy (Rainbow) mine on Glacier Bay from April 3 to November 8 and treated gold ore in an 18–20-ton amalgamation-flotation mill; from the 119 tons of ore which was milled, 281 ounces of gold and 120 ounces of silver were recovered as bullion by amalgamation, and 4 tons of flotation concentrate (containing 71 ounces of gold, 46 ounces of silver, 11 pounds of copper, and 450 pounds of lead) was shipped to a smelter in the United States.

Ketchikan District.—The only mine in the district with reported production in 1950 was the Dawson on Prince of Wales Island, operated by Wendell Dawson from March 1 to July 15; gold ore was treated by amalgamation and gravity concentration and, small quantities of ore and concentrate were shipped to a smelter in the United States.

YUKON RIVER BASIN REGION

One hundred and twenty placer mines and 2 lode mines in 17 districts in the Yukon River Basin region supplied 63 percent of the total Alaska gold recorded as having been produced in 1950. Sixty-nine percent of the 182,911 ounces of placer gold produced in the region came from 11 bucket-line dredges. The Fairbanks district continued to be the most important gold-producing area in the region and the Territory.

Chandalar District.—The R. W. Sellars bulldozer-hydraulic operation on Big Creek produced a substantial quantity of gold during a short season from July 1 to September 30, 1950.

Circle District.—Two bucket-line dredges were active in the Circle district during 1950; Gold Placers, Inc., operated its Diesel-powered dredge (equipped with sixty 4-cubic-foot buckets) on Coal Creek from April 17 to October 29, and C. J. Berry Dredging Co. operated its dredge on Lower Mammoth Creek from May 30 to October 22 (385,000 cubic yards of gravel was washed to recover 5,770 ounces of gold and 1,098 ounces of silver). The P. R. & H. Mining Co. operation on Lower Deadwood Creek—using bulldozers to deliver gravel to a sluice plate—ranked third in production of gold in the district. Other producers of 100 ounces or more of gold in the district were Deadwood Mining Co. on Upper Deadwood Creek (dragline-bulldozer-hydraulic), Kelly & Wilkinson on Miller Creek (bulldozer-hydraulic; 396 ounces of gold and 73 ounces of silver recovered from 11,108 cubic yards of gravel washed between May 14 and September 23), Harrison Creek Mining Co. on Harrison Creek (hydraulic), Portage Mining Co. on Portage Creek (dragline-bulldozer), and A. A. Zimmerman on Independence Creek (hydraulic).

Eagle District.—The Yukon Placer Mining Co., using bulldozer equipment, operated on Fourth of July Creek from July 1 to August 31 and recovered a substantial quantity of gold. The Crooked Creek Placer Co. (Bauer & Celich) hydraulicked on Crooked Creek from April 15 to September 25 to recover 40 ounces of gold and 4 ounces of silver from 1,750 cubic yards of gravel washed.

Fairbanks District.—The United States Smelting, Refining & Mining Co. operated five bucket-line dredges in the Fairbanks district in 1950 and—as in previous years—was by far the largest producer of gold, not only in the district but in the Territory. The company operated three 6-cubic-foot Bethlehem dredges (one with 68 buckets and two with 78 buckets), one 10-cubic-foot Bethlehem dredge (with 93 buckets), and one 10-cubic-foot Yuba dredge (with 106 buckets); all dredges are operated electrically. Other equipment used (chiefly for removing overburden) included 213 Joshua Hendy hydraulic giants and an electrically powered Bucyrus 10-W dragline. The

Goldstream dredge was moved to Fairbanks Creek during the winter of 1949–50 and operated at the new location during 1950.

The Brinker-Johnson Co., the second-largest producer in the Fairbanks district in 1950, operated its Walter W. Johnson Co. Diesel-powered bucket-line dredge (equipped with seventy-eight 4½-cubic-foot buckets) on Caribou Creek from May 16 to October 31.

Of the producers of gold from placer mines worked hydraulically and in combination with a dragline, bulldozer, and pumping equipment, the Alder Creek Mining Co. operation on Fairbanks Creek was the largest. From 300,000 cubic yards of gravel washed between May 1 and October 15, 3,966 ounces of gold and 595 ounces of silver were recovered. The equipment used for moving tailings, removing overburden, and delivering gravel to sluice boxes included six hydraulic giants, two dragline excavators (with 1½ and 2-cubic-yard buckets, respectively), and three bulldozers. Other producers of a substantial quantity of placer gold in the district using similar combinations of equipment were Four A Mining Co. on Pedro Creek (bulldozer-hydraulic), Hassel & Sticha on Ready Bullion Creek (dragline-bulldozer-hydraulic), Hope Mine on Deep Creek and Faith Creek (bulldozer-bedrock sluice), Helmer Johnson on Cleary Creek (bulldozer-hydraulic), N. O. Kupoff on Pedro Creek (bulldozer-hydraulic), C. B. Martin on Pedro and Banner Creeks (bulldozer-hydraulic), and Ernest L. Maurer on First Chance Creek (bulldozer-hydraulic).

Production of gold from lode mines in the Fairbanks district showed an increase in 1950 over the 1949 production despite only two operators reporting activity. Verne Jokela & Charles Lazeration worked the Greenback claims at the head of Little Eldorado Creek, 1 mile north of Pedro Dome; from 139 tons of gold ore treated by amalgamation at the Cleary Hill Mines Co. mill on Cleary Creek, 274 ounces of gold and 44 ounces of silver were recovered as bullion. John Vuyovich operated a lode-gold property on Ester Dome and milled the ore in the St. Paul mill on Eva Creek to recover a small quantity of gold by amalgamation. Doug Jackson and Earl Beistline operated the Cleary Hill mine under lease from Cleary Hill Mines Co. and milled their ore at the property; no gold was reported as being marketed from the operation.

Fortymile District.—An unusually dry season with consequent shortage of water resulted in curtailment of mining activity and decreased gold production in the Fortymile district in 1950. The Wade Creek Dredging Co., using a bulldozer to deliver gravel to a sluice box on Wade Creek, was the largest gold producer in the district in 1950, even though the output was about half of what it was in 1949. The Franklin Mining Co. operation (dragline-bulldozer-hydraulic) on claim 2 below Discovery on Chicken Creek from June 1 to September 15 ranked second in production of gold in the district. The Yukon Placer Mining Co., operating on Canyon Creek, dropped from first place as a producer of gold in the district in 1949 to third in 1950; its bucket-line dredge was idle during the year, and operations were limited to the use of a bulldozer to deliver gravel to sluice boxes. Other operators producing 100 ounces or more of gold from placers worked in the district, using various combinations of dragline-bulldozer-hydraulic equipment in conjunction with sluice boxes either of the bedrock or elevated type, were Lee Dragon on Fortymile River, William Meldrum on claim 1 above Discovery on Chicken Creek (119 ounces of gold and 23 ounces of silver recovered from 5,000 cubic yards of gravel handled by the bulldozer-hydraulic method from March 1 to October 30), Myers Fork Mining Co. on Myers Fork (217 ounces of gold and 43 ounces of silver recovered from 1,733 cubic yards of gravel handled by bulldozer-hydraulic method from May 20 to September 21), Squaw Creek Mining Co. on Squaw Creek, and Uhler Creek Mining Co. on Uhler Creek.

Hot Springs District.—The largest producer of gold in the Hot Springs district in 1950 as in 1949 (on the basis of reported data), was A. W. Pringle on Rhode Island Creek (bulldozer-hydraulic). Other producers in the district with reported outputs exceeding 100 ounces of gold, using various combinations of dragline-bulldozer-hydraulic equipment, were Cleary Hill Mines Co. on Sullivan Creek and Tofty Gulch; Joe Coble & Earl Francis on Lower Eureka Creek, Pete Johnson & Louis Johnson on Glenn Gulch, and Norheim & Anderson on Alameda Creek (102 ounces of gold and 24 ounces of silver recovered from 3,330 cubic yards of gravel by the bulldozer-hydraulic method from July 1 to September 25). Larsen & Windish recovered a comparable quantity of gold by deep drift placer mining on the right limit of Woodchopper Creek.

Hughes District.—Only one producer reported activity in the Hughes district in 1950. Strandberg & Sons, using dragline-bulldozer equipment with a dry-land washing plant, recovered a substantial quantity of gold from Utopia Creek.

Iditarod District.—North American Dredging Co., the largest producer of gold in the Iditarod district in 1950 as in 1948 and 1949 (on the basis of reported data), operated its Diesel-powered bucket-line dredge equipped with seventy 3½-cubic-yard buckets on the Browne Estate property on Otter Creek from April 1 to November 9. The Pete Miscovich & Son operation on Otter Creek—using two bulldozers, hydraulic lift, hoe shovel (1½-cubic-yard), and hydraulic giant equipment—ranked second in gold production in the district. Other operators producing a moderate to large quantity of gold by various placer methods in the district included Backstrom & Pearson on Flat Creek (from 3,000 cubic yards of gravel hydraulicked between May 5 and October 1, 220 ounces of gold and 36 ounces of silver were recovered), Happy Placers on Happy Creek (from 7,407 cubic yards of gravel worked by the bulldozer-hydraulic method from May 25 to October 6, 170 ounces of gold and 42 ounces of silver were recovered), Hatton & Turner on Willow Creek (bulldozer-dragline), Prince Creek Mining Co. on Prince Creek (298 ounces of gold and 52 ounces of silver recovered from 30,000 cubic yards hydraulicked from June 15 to November 20), Patrick Savage on Willow and Flat Creeks (drag-line-bulldozer-hydraulic), Uotila & Ogriz on Slate Creek (525 ounces of gold and 105 ounces of silver recovered from 133,000 cubic yards of gravel handled by the dragline-bulldozer-hydraulic method from May 1 to October 7).

Innoko District.—Two bucket-line dredges were active in the Innoko district in 1950. Innoko Dredging Co. operated its Diesel-powered dredge (equipped with sixty-six 3½-cubic-foot buckets) on Upper Ganes Creek from May 26 to October 25. Neil Beaton operated a flume-type dredge on Lower Ganes Creek from June 10 to

October 5. Other principal operators of gold-placer mines in the district in 1950—nearly all of which used dragline-bulldozer-hydraulic equipment combinations in conjunction with a sluice box, either of the bedrock or elevated type—were Carlson & Lindquist on Victor Gulch, Colorado Creek Mining Co. on Colorado Creek, Joseph A. Degnan on Lower Little Creek, Gurtler & Myklebust on Anvil and Little Creeks, Hard & Uotilla on Forgotten Bench on Bear Creek and on the Wedge Fraction between Cripple and Beaver Creeks, H. Matheson and P. Savage on Spruce Creek, I. C. McFarland on Little Creek (Six Pup), Rosander & Reed on Yankee Creek, and Uotila & Hard on Ophir Creek.

Kaiyuh District.—Two gold-placer operations were active in the Kaiyuh district in 1950, Iditarod Operating Co. on Golden Creek and Morelock Mining Co. on Rosa Creek (both used bulldozer-hydraulic equipment).

Kantishna District.—The Hosler Mines operated on Moose Creek, a tributary of Kantishna River, from June 10 to September 10, 1950, using bulldozer-hydraulic equipment.

Koyukuk District.—The largest producer of gold in the Koyukuk district in 1950 was the Myrtle Creek Mining Co. on Myrtle Creek. The company operated from June through September using dragline-bulldozer equipment with bedrock sluices. The second-highest producer of gold in the district was Nesland & White on Vermont Creek (bulldozer-hydraulic). In addition, 13 individuals (on the basis of reported data) active in the district in 1950 produced small quantities of gold (under 100 ounces), using small-scale hand, hydraulic, and bulldozer-hydraulic methods of recovery. Joseph B. Blundell operated two drift placer mines, one on Jim Pup (claim No. 1 below Discovery) and one on Wakeup Creek.

Rampart District.—The Little Minook Mining Co. operated on Little Minook Creek (claim No. 9 above Discovery) during the 1950 Season from May 1 to September 30 and recovered 1,412 ounces of gold and 86 ounces of silver from 149,900 cubic yards of gravel. Equipment used included one dragline (1½-cubic-yard bucket), two bulldozers, three hydraulic giants, and one Diesel-powered pumping unit. Swanson Bros., operating on Hunter Creek from May 22 to September 11 (bulldozer-hydraulic with sluice plate and bedrock boxes), recovered a substantial quantity of gold. Hunter Creek Mining Co. produced 162 ounces of gold and 13 ounces of silver by the bulldozer-hydraulic method on Hunter Creek from May 14 to August 25. The Pioneer Mining Co. (J. H. Pierce) washed 8,800 cubic yards of gravel by the bulldozer-sluice plate method on Hoosier Creek and recovered 70 ounces of gold and 9 ounces of silver. Frank J. Dinan worked claim 2 below Discovery on Florida Creek by drift mining and recovered a small quantity of gold.

Ruby District.—Pete Miscovich & Son, using a dragline-bulldozer-hydraulic combination on Flat Creek June 1 through September 20, was the largest gold producer in the Ruby district in 1950. The Granite Creek Mining Co. on Ophir Creek recovered 589 ounces of gold and 119 ounces of silver from May 1 to October 7 from 20,000 cubic yards of gravel, using the bulldozer-hydraulic method. Other large producers of gold using similar methods were Iver Johnson & Co.

on Trail Creek (dragline-bulldozer-pump), Long Creek Mining Co. on Long Creek (dragline-bulldozer-hydraulic), and Sig Wiig on Spruce Creek. Clarence Zaiser on Spruce Creek recovered 67 ounces of gold and 8 ounces of silver from September 1 to September 30 by hydraulic methods, using a dragline and bulldozer for moving tailings and overburden.

Tolovana District.—Olive Creek Mines (as in 1949) was the largest producer of gold in the Tolovana district in 1950; the property was operated from June 1 to September 25 with dragline-bulldozer-pump equipment. Wilbur Creek Mines operated on Wilbur Creek (bulldozer-hydraulic) from July 1 to August 31. Warwick Mines, using a bulldozer-hydraulic combination on Gertrude Creek, recovered 22 ounces of gold and some silver from April 10 to September 29. Operations were curtailed because of a shortage of water.

OTHER MINERALS

Antimony.—Earl Pilgrim did development work and mining at the Stampede mine in the Kantishna district during the winter of 1950. None of the 62 short tons of ore mined, containing an estimated 58 percent antimony, was shipped by the end of the year. Although the Sawtooth Mining Co. did no mining during 1950 at its property near Rampart, 100 tons of 50-percent antimony ore mined in 1948 and stockpiled at the mine was sold in 1950 and reportedly was to be shipped to a smelter in the United States.

Coal.—Alaska produced 412,455 short tons (final figure) of bituminous and subbituminous coal in 1950, 5 percent less than the record total of 1949. The greatest proportion of the output was produced by the Evan Jones Coal Co. from the Matanuska field and the Healy River Coal Corp. and Usibelli Coal Mine, Inc., from the Nenana (Healy) field. The complete list of companies that operated coal mines in 1950 is given in table 13. Two mine fires that occurred almost simultaneously in the Suntrana mine of the Healy River Coal Corp. in late August resulted in serious curtailment of production for several weeks. Of interest to the industry was development of a new strip mine in the Nenana field during the late summer of 1950 by the Cripple Creek Coal Co. on ground adjacent to the Usibelli Coal Mine, Inc. Production for an Army contract began in November, and despite the delayed start, late in the season, output was high enough to place the mine fifth among Alaskan coal producers for the year.

Platinum Metals.—Placer deposits in the Goodnews Bay district, Kuskokwim region, continued to yield a substantial quantity of crude platinum metal; the output in 1950 was higher than in 1949. The Goodnews Bay Mining Co. operated its electrically powered bucketline dredge (with ninty-three 8-cubic-foot buckets) between April 24 and November 12 and a 1¼-cubic-yard dragline-bulldozer-hydraulic combination from May 24 to October 5 for recovering crude platinum metals; both operations were on the Salmon River. Because of the necessity of handling clay encountered during the early part of the season, the dredge was shut down several weeks for remodeling the

232294—53——88

TABLE 13.—Coal-producing mines in Alaska in 1950, in order of output

Rank 1950	Rank 1949	Company	Field	Region	Type of coal	Mining method
1	1	Evan Jones Coal Co	Matanuska	Cook Inlet-Susitna	Bituminous	Underground.
2	2	Healy River Coal Corp	Nenana	Yukon River Basin	Subbituminous	Underground and strip.
3	3	Usibelli Coal Mine, Inc	do	do	do	Strip.
4	5	Houston Coal Co	Matanuska	Cook Inlet-Susitna	Bituminous	Do.
5	(1)	Cripple Creek Coal Co	Nenana	Yukon River Basin Region	Subbituminous	Do.
6	4	Diamond Coal Co	do	do	do	Do.
7	6	Alaska Native Service [2]	Point Barrow	Northern Alaska	do	Underground.
8	(3)	Buffalo Coal Co	Matanuska	Cook Inlet-Susitna	Bituminous	Do.
9	8	Homer Coal Corp	Homer	Kenai Peninsula	Subbituminous	Underground and strip.
10	10	Knob Creek Coal Co	Matanuska	Cook Inlet-Susitna	Bituminous	Underground.
11	7	Alaska Matanuska Coal Co	do	do	do	Do.
(3)	12	W. E. Dunkle	Valdez Creek	do	Subbituminous	Do.

1 Began operations in the fall of 1950.
2 Meade River mine.
3 Did not operate.

recovery system. An extension on the trommel screen and installation of a high-pressure pump washing system proved to be successful in solving the problem. An adjunct to the redesigned recovery system, of particular interest to dredge operators, is an ingenious distributor installed at the end of the stacker belt. By means of this device—which can be actuated manually by electric controls or set to operate automatically—any clayey material that passes over the stacker can be selectively placed on the tailing pile for subsequent reworking by other means for recovering contained platinum metals.

Pumice.—During 1950 pumice was mined at Geographic Bay off Shelikof Strait by Stock & Grove for building use in the Anchorage area.

Sand and Gravel.—Production of sand and gravel in Alaska in 1950 amounted to 3,050,000 short tons. Producers were R. J. Sommers Construction Co., Juneau; the Alaska Road Commission; Bureau of Public Roads; Naval Operating Base, Kodiak; and the Corps of Engineers, Department of the Army.

Tin.—The Northern Tin Co. recovered placer tin from its Buck Creek operation, and the U. S. Tin Corp. continued its tin-placer operation at Lost River in the Port Clarence district, Seward Peninsula region. The Cleary Hill Mines Co. reported recovery of a small quantity of tin concentrate as the byproduct of its placer-gold operation near Tofty in the Hot Springs district, Yukon River Basin region. The over-all production for the Territory in 1950 was approximately 150 short tons of placer-tin concentrate, containing 89 short tons (79 long tons) of tin. No lode-tin mines were active during the year, but the U. S. Tin Corp. formulated plans for developing known lode-tin deposits at Lost River. According to the company, the tin has proved to be recoverable from the tin-tungsten concentrate by using a tin-smelting process now under development, which is currently being operated on a pilot-plant scale at Tacoma, Wash.

Tungsten.—The J. H. Scott Co. reported shipment of some tungsten (scheelite) concentrate produced at the Riverside mine near Hyder, Southeastern Alaska. The material was from a stockpile accumulated as a byproduct of the milling of lead ore mined before 1950. The U. S. Tin Corp. produced 88.5 tons of tin-tungsten concentrate, containing 8.62 percent tungsten trioxide, from its placer property at Lost River, Port Clarence district, Seward Peninsula region, during 1950. By use of a new treatment process under development by the company, the tin would be recovered as a metallic tin and the tungsten as a tungsten-rich residue from the tin smelting. The Rocky Mountain Mining Co., shipped about 1,600 pounds of tungsten concentrate accumulated as a by product from gold-placer operations in the Nome district, Seward Peninsula region, during 1948 and 1949.

Miscellaneous Minerals.—Data on production of stone are not available for publication. There was no recorded production of asbestos, chromite, gem stones, mercury, or petroleum in Alaska in 1950. The Navy Department has released little official information regarding the oil-drilling project in progress on Naval Petroleum Reserve 4, north of the Brooks Range, Northern Alaska region. Reportedly, gas had been obtained from certain wells in adequate quantity for use in the camp, and heating and cooking units had been altered to utilize this natural fuel.

BIBLIOGRAPHY

Bressler, C. T. Garnet Deposits Near Wrangell, Southeastern Alaska. Geol. Survey Bull. 963–C, 1950, 92 pp.

Coats, Robert R. Volcanic Activity in the Aleutian Arc. Geol. Survey Bull. 974–B, 1950, 47 pp.

Hopkins, D. M., and Sigafoos, R. S. Frost Action and Vegetation Patterns on Seward Peninsula, Alaska. Geol. Survey Bull. 974–C, 1950, 100 pp.

Kerns, W. H. Investigation of Taylor Creek Lead-Zinc Deposit, Kupreanof Island, Petersburg, Alaska. Bureau of Mines Rept. of Investigations 4669, 1950, 13 pp.

Moffit, Fred H., and Fellows, Robert E. Copper Deposits of the Prince William Sound District, Alaska. Geol. Survey Bull. 963–B, 1950, 77 pp.

Rutledge, F. A. Investigation of Mercury Deposits, Cinnabar Creek Area, Georgetown and Akiak Districts, Kuskokwim Region, Southwestern Alaska. Bureau of Mines Rept. of Investigations 4719, 1950. 9 pp.

Arizona

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Paul Luff

GENERAL SUMMARY

ARIZONA'S output of copper increased from 359,010 short tons in 1949 to 403,301 tons in 1950, the largest output since 1929, when the State reached its peak production of 415,314 tons. Gold production increased from 108,993 fine ounces in 1949 to 118,313 in 1950, a 9-percent gain, and silver from 4,970,736 fine ounces to 5,325,441, a 7-percent gain; however, the production of lead declined from 33,568 short tons to 26,383, a 21-percent loss, and zinc from 70,658 short tons to 60,480, a 14-percent loss. The State remained the largest producer of copper in the United States; ranked third in zinc, fourth in silver, fifth in lead, and sixth in gold; and again ranked first in total value of the five metals.

The total value of the five metals was $201,033,694 in 1950, the highest since 1918 and a 13-percent gain over the $177,894,134 in 1949. Arizona's total value of the five metals has exceeded $200,000,000 in only two other years—1917 and 1918. The total value of the gold in 1950 was $4,140,955—2 percent of the State total value; silver, $4,819,-793—2 percent; copper, $167,773,216—83 percent; lead, $7,123,410—4 percent; and zinc, $17,176,320—9 percent. The value of the metals recovered from copper ore was $169,717,981 in 1950 ($143,441,196 in 1949), or 84 percent of the State total, and that recovered from zinc-lead ore was $23,035,993 ($28,510,900 in 1949), or 11 percent of the State total. About 88 percent of the State gold production and 75 percent of the silver in 1950 came from six districts—Ajo, Big Bug, Copper Mountain (Morenci), Pioneer (Superior), Verde (Jerome), and Warren (Bisbee); 99 percent of the copper came from eight districts—Ajo, Copper Mountain (Morenci), Eureka (Bagdad), Globe-Miami, Mineral Creek (Ray), Pioneer (Superior), Verde (Jerome), and Warren (Bisbee); 93 percent of the lead came from six districts—Aravaipa, Big Bug, Harshaw, Old Hat, Pima, and Warren (Bisbee); and 93 percent of the zinc came from seven districts—Big Bug, Harshaw, Old Hat, Pima, Pioneer (Superior), Verde (Jerome), and Warren (Bisbee).

Outstanding features of Arizona's mining activities in 1950 were resumption in January of copper mining at the Copper Queen mine of the Phelps Dodge Corp. at Bisbee, resumption in July of zinc-copper mining at the Magma mine at Superior and in August at the Republic-Mammoth group near Dragoon, the beginning in January of open-pit mining at the Ray copper mine of the Kennecott Copper Corp., the closing in June of the Phelps Dodge copper smelter at Clarkdale, the beginning in July of smelting at the new copper smelter of the Phelps Dodge Corp. at Ajo, the record production of copper in the Mineral Creek (Ray) district, and the record output of zinc in the Big Bug and Verde (Jerome) districts.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. The value of metal production has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948-50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Arizona, 1946–50, and total, 1860–1950, in terms of recoverable metal [1]

Year	Lode mines		Placer mines		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	194	31,058,179	33	168,200	79,024	$2,765,840	3,268,765	$2,641,162
1947	315	38,636,280	30	9,400	95,860	3,355,100	4,569,084	4,135,021
1948	360	39,925,686	39	100,895	109,487	3,832,045	4,837,740	4,378,399
1949	340	38,372,879	32	81,485	108,993	3,814,755	4,970,736	4,498,767
1950	309	42,709,272	24	3,290	118,313	4,140,955	5,325,441	4,819,793
1860–1950	--------	(2)	--------	(2)	11,300,812	283,023,575	312,390,415	235,096,679

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	289,223	$93,708,252	23,930	$5,216,740	43,665	$10,654,260	$114,986,254
1947	366,218	153,811,560	28,566	8,227,008	54,644	13,223,848	182,752,537
1948	375,121	162,802,514	29,899	10,703,842	54,478	14,491,148	196,207,948
1949	359,010	141,449,940	33,568	10,607,488	70,658	17,523,184	177,894,134
1950	403,301	167,773,216	26,383	7,123,410	60,480	17,176,320	201,033,694
1860–1950	12,681,742	3,935,114,032	492,473	85,022,880	517,730	115,788,421	4,654,045,587

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, or copper precipitates shipped directly to smelters during the calendar year indicated.
[2] Figure not available.

The average price of copper and zinc increased in 1950—copper to 20.8 cents a pound and zinc to 14.2 cents a pound—but the average price of lead declined to 13.5 cents a pound. The price of gold remained at $35 a fine ounce and silver at $0.905+ a fine ounce. At the beginning of the year the price of copper was 18.50 cents a pound, lead 12.00 cents a pound, and zinc 9.75 cents a pound. At the close of the year the price of copper was 24.50 cents a pound, lead 17.00 cents a pound, and zinc 17.50 cents a pound.

TABLE 3.—Gold produced at placer mines in Arizona, 1946–50, by class of mine and method of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Dragline dredges:					
1946	1	160,000	185	$6,475	$0.04
1947–50					
Nonfloating washing plants: [1]					
1946	2	6,000	116	4,060	.68
1947	2	2,700	34	1,190	.44
1948	3	97,800	637	22,295	.23
1949	3	76,800	426	14,910	.19
1950	1	100	75	2,625	26.25
Small-scale hand methods:					
Wet and dry:					
1946	26	2,000	81	2,835	1.42
1947	19	6,500	241	8,435	1.30
1948	25	2,960	185	6,475	2.19
1949	27	4,365	130	4,550	1.04
1950	20	2,740	48	1,680	.61
Underground placers:					
Drift:					
1946	4	200	16	560	2.80
1947	9	200	39	1,365	6.83
1948	11	135	16	560	4.15
1949	2	320	9	315	.98
1950	3	450	19	665	1.48
Grand total placers:					
1946	33	168,200	398	13,930	.08
1947	30	9,400	314	10,990	1.17
1948	39	100,895	838	29,330	.29
1949	32	81,485	565	19,775	.24
1950	24	3,290	142	4,970	1.51

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	9,326	433,140	30,560	2,960	6,585
February	8,998	400,245	28,888	2,528	5,775
March	10,031	464,852	32,409	3,030	6,295
April	9,756	466,570	32,638	2,466	5,270
May	10,112	484,935	34,728	2,538	5,615
June	9,991	437,086	35,203	2,330	4,965
July	8,765	384,300	31,498	1,726	3,845
August	8,752	421,880	33,200	1,798	4,565
September	9,691	446,233	34,028	1,803	4,615
October	10,586	464,400	36,103	1,883	4,565
November	10,769	469,400	37,228	1,728	4,195
December	11,536	452,400	36,818	1,593	4,190
Total: 1950	118,313	5,325,441	403,301	26,383	60,480
1949	108,993	4,970,736	359,010	33,568	70,658

Gold.—Production of gold in Arizona in 1950 was 118,313 fine ounces, the largest since 1943 and a gain of 9,320 ounces over 1949. Most of the gold and silver produced in the State are byproducts of copper ore and zinc-lead ore; in 1950 these two classes of ore yielded 103,311 ounces of gold (87 percent of the State total) compared with 99,164 ounces in 1949. Copper ore yielded 79,567 ounces of gold (67 percent of the total), an increase of 832 ounces over 1949, and zinc-lead ore 23,744 ounces (20 percent of the total), an increase of 3,315 ounces. Most of the remainder of the gold came from zinc-copper ore (5 percent of the total), lead ore (4 percent of the total), and gold ore (2 percent of the total). The largest increases in gold output in Arizona in 1950 occurred at the Iron King zinc-lead mine at Humboldt, the Copper Queen copper mine at Bisbee, the Magma copper and zinc-copper mine at Superior, and the Morenci copper mine at Morenci. Gold from placers decreased from 565 ounces to 142. The New Cornelia mine of the Phelps Dodge Corp. in Pima County continued to be the leading gold producer in Arizona; it was followed by the Iron King mine in Yavapai County, the Magma mine in Pinal County, the Copper Queen (Bisbee) branch of the Phelps Dodge Corp. in

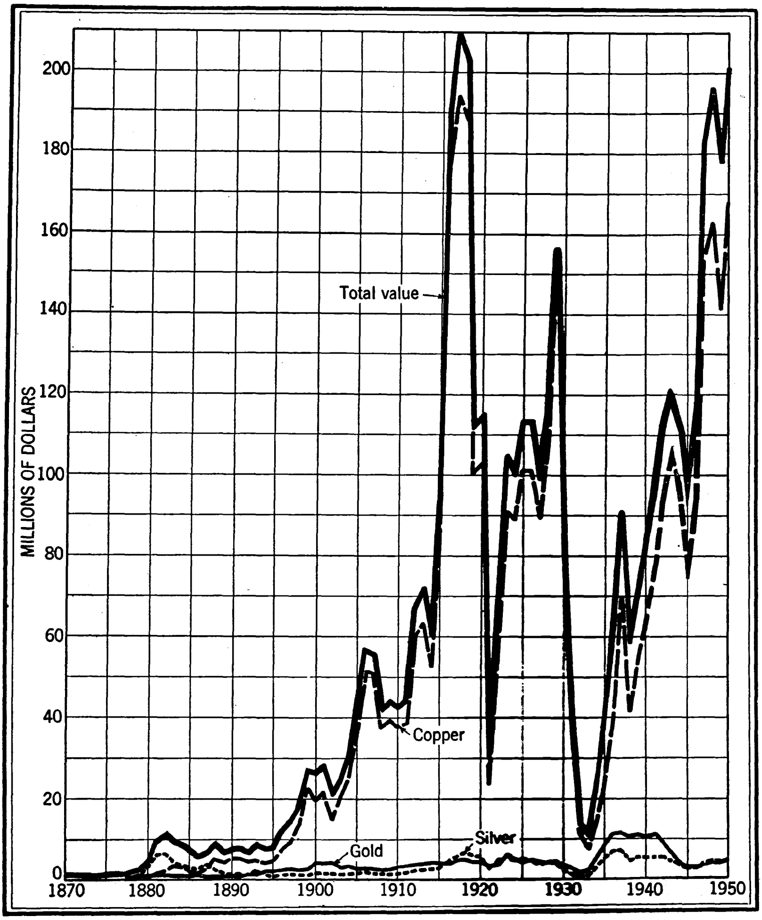

FIGURE 1.—Value of mine production of gold, silver, and copper and total value of gold, silver, copper, lead, and zinc in Arizona, 1870–1950.

Cochise County, the Morenci branch of the Phelps Dodge Corp. in Greenlee County, and the United Verde branch of the Phelps Dodge Corp. in Yavapai County; these six properties produced 88 percent of the State total gold.

Silver.—Production of silver in Arizona in 1950 was 5,325,441 fine ounces, the largest output since 1943 and a gain of 354,705 ounces over 1949. In 1950 copper ore and zinc-lead ore yielded 4,459,176 ounces of silver (84 percent of the State total) compared with 4,332,989 ounces in 1949. An increase in production of silver from copper ore in 1950 prevented a decline in the State silver output. Copper ore yielded 2,853,599 ounces of silver (54 percent of the State total), an increase of 441,240 ounces (18 percent) over 1949, and zinc-lead ore 1,605,577 ounces (30 percent of the total), a decrease of 315,053 ounces (16 percent). Most of the remaining silver came from silver ore (8 percent of the total), zinc-copper ore (7 percent of the total), and lead ore (1 percent of the total). The greatest increases in silver output in Arizona in 1950 occurred at the Morenci, Iron King, Magma, and Ray properties. The Phelps Dodge Corp., with a slightly higher output than in 1949, continued to be the chief silver producer in Arizona; its four properties (Copper Queen, Morenci, New Cornelia, and United Verde) produced 52 percent of the State silver output, 59 percent of the gold, and 61 percent of the copper. Other large silver producers in Arizona in 1950 were Iron King, Magma, Ash Peak, San Xavier (Eagle-Picher Mining & Smelting Co.), Flux, St. Anthony, and Ray (Kennecott Copper Corp.) properties.

Copper.—Arizona's output of recoverable copper increased to 403,301 short tons in 1950, the largest production since 1929 and 12 percent over 1949. Copper output increased substantially in each of the principal copper-producing districts except the Verde (Jerome) district, where it declined 3,924 tons. The Copper Mountain (Morenci) district, with an output of 154,689 tons of copper, remained the leading copper-producing district in the State; it was followed by the Globe-Miami district with 84,688 tons, Ajo with 64,400, Mineral Creek (Ray) with 36,442, Pioneer (Superior) with 22,636, Warren (Bisbee) with 13,345, Verde (Jerome) with 13,291, and Eureka (Bagdad) with 10,673. Copper production at the Ray property of the Kennecott Copper Corp. increased 17,767 tons or 96 percent. There were also substantial increases at the Inspiration, Morenci, New Cornelia, Bagdad, and Copper Queen properties. Copper ore and its products yielded 790,136,395 pounds of copper as follows: 37,586,791 tons of copper ore treated by concentration yielded 84 percent of the copper; 415,120 tons of copper ore shipped crude to smelters 5 percent; and 3,755,362 tons of copper ore leached and 17,378 tons of cement copper (from mine-water precipitates and underground leaching operations) 11 percent. The Morenci branch of the Phelps Dodge Corp. was again the largest copper producer in Arizona; it was followed in order by the New Cornelia branch of the Phelps Dodge Corp., Inspiration, Ray (Kennecott Copper Corp.), Miami, Castle Dome, Magma, Copper Queen branch of the Phelps Dodge Corp., United Verde branch of the Phelps Dodge Corp., and Bagdad properties. These 10 properties produced 99 percent of the State total copper.

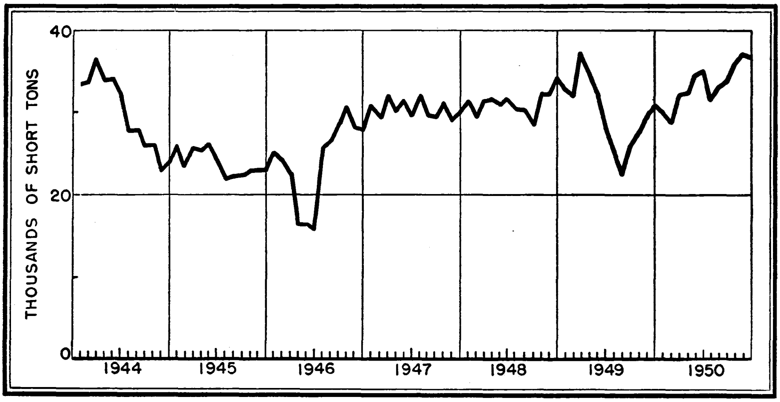

FIGURE 2.—Mine production of copper in Arizona, 1944–50, by months, in terms of recoverable metal.

Lead and Zinc.—In 1950 Arizona's production of recoverable lead and zinc was much less than in 1949; lead dropped to 26,383 short tons—a decrease of 7,185 tons—and zinc to 60,480 short tons—a decrease of 10,178 tons. These decreases resulted mainly from a decline in output of zinc-lead ore from the Copper Queen mine at Bisbee, where there is gradual depletion of ore reserves. Despite a 44-percent decrease in lead production and a 41-percent drop in zinc, the Copper Queen mine of the Phelps Dodge Corp. remained the largest producer of lead and zinc in Arizona. Other large producers of lead, in order of output, were the St. Anthony property at Tiger, Iron King mine at Humboldt, San Xavier mine near Sahuarita, Flux group near Patagonia, and Aravaipa group near Klondyke. Other large producers of zinc, in order of output, were the Iron King, United Verde branch of the Phelps Dodge Corp., San Xavier, St. Anthony, Flux, Magma, Republic & Mammoth (Coronado Copper & Zinc Co.), and Old Dick properties. Zinc production at the United Verde mine increased 79 percent, and both lead and zinc production increased substantially at the Iron King and Flux mines. Of the State totals, 30 percent of the lead and 34 percent of the zinc came from the Warren (Bisbee) district in Cochise County. Other large lead- and zinc-producing districts were the Big Bug in Yavapai County, Old Hat in Pinal County, Pima in Pima County, Harshaw in Santa Cruz County, and Aravaipa in Graham County. Additional large zinc-producing districts were the Verde (Jerome) in Yavapai County, Pioneer (Superior) in Pinal County, Eureka (Bagdad) in Yavapai County, and Cochise (Dragoon) in Cochise County. About 92 percent of the total lead and over 77 percent of the total zinc came from zinc-lead ore; 7 percent of the total lead came from lead ore, and most of the remainder of the lead came from zinc-copper ore, zinc-lead-copper ore, and gold-silver ore; and 20 percent of the total zinc came from zinc-copper ore and most of the remainder from zinc ore and zinc-lead-copper ore.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Cochise	20	1	15,464	$541,240	1,156,509	$1,046,699
Coconino	2				106	96
Gila	28	1	2,447	85,645	141,285	127,870
Graham	12		665	23,275	16,187	14,650
Greenlee	4		10,527	368,445	981,933	888,699
Maricopa	15	2	23	805	6,561	5,938
Mohave	27	2	201	7,035	11,596	10,495
Pima	20	1	37,877	1,325,695	661,510	598,700
Pinal	39		18,915	662,025	908,935	822,632
Santa Cruz	31		154	5,390	172,144	155,799
Yavapai	71	10	31,511	1,102,885	1,264,641	1,144,564
Yuma	40	7	529	18,515	4,034	3,651
Total: 1950	309	24	118,313	4,140,955	5,325,441	4,819,793
1949	340	32	108,993	3,814,755	4,970,736	4,498,767

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Cochise	27,750,500	$5,772,104	17,266,200	$2,330,937	43,556,000	$6,184,952	$15,875,932
Coconino	32,100	6,677					6,773
Gila	170,740,700	35,514,066	159,000	21,465	2,500	355	35,749,401
Graham	86,300	17,950	2,996,200	404,487	1,842,000	261,564	721,926
Greenlee	309,378,100	64,350,645	1,600	216			65,608,005
Maricopa	18,900	3,931	12,600	1,701			12,375
Mohave	627,600	130,541	164,400	22,194	865,200	122,858	293,123
Pima	129,592,400	26,955,219	6,058,000	817,830	11,638,000	1,652,596	31,350,040
Pinal	119,214,700	24,796,658	12,244,200	1,652,967	14,398,500	2,044,587	29,978,869
Santa Cruz	312,000	64,896	4,234,000	571,590	9,175,000	1,302,850	2,100,525
Yavapai	48,807,300	10,151,918	9,421,800	1,271,943	39,472,400	5,605,081	19,276,391
Yuma	41,400	8,611	208,000	28,080	10,400	1,477	60,334
Total: 1950	806,602,000	167,773,216	52,766,000	7,123,410	120,960,000	17,176,320	201,033,694
1949	718,020,000	141,449,940	67,136,000	10,607,488	141,316,000	17,523,184	177,894,134

MINING INDUSTRY

Despite a material decline in output of zinc-lead ore in Arizona in 1950, the State total ore mined and treated increased to 42,709,272 tons, the largest annual output ever recorded in the State's history and a gain of 4,336,393 tons (11 percent) over 1949. The demand for copper was strong throughout the year. Its price reached 24.50 cents a pound October 2, and copper ore was mined during the last quarter of the year at a higher rate than at any time during the past several years. The output of copper ore increased 12 percent—from 37,365,611 tons in 1949 to 41,757,273 tons in 1950, the highest annual tonnage ever mined in the State, but that of zinc-lead ore decreased 20 percent—from a record 773,617 tons in 1949 to 617,547 tons in 1950. Zinc-copper ore increased to 248,391 tons—a 52-percent gain—and siliceous ores to 63,238 tons—a 62-percent gain; but zinc ore declined to 7,159 tons—a 31-percent loss—and lead ore to 13,142 tons—a 17-percent loss. Of the State total ore, 41,722,536 tons (98 percent) was copper ore mined in the Ajo, Copper Mountain

(Morenci), Eureka (Bagdad), Globe-Miami, Mineral Creek (Ray), Pioneer (Superior), Verde (Jerome), and Warren (Bisbee) districts. Of the State total zinc-lead ore, 588,760 tons (95 percent) was mined in the Big Bug, Harshaw, Old Hat (Oracle), Pima, and Warren (Bisbee) districts. Mining at six open pits—Ajo, Bagdad, Inspiration, Miami (Castle Dome), Morenci, and Ray—produced 33,358,059 tons of copper ore averaging 1.033 percent copper in 1950, compared with five open pits in 1949, which produced 29,082,243 tons of ore averaging 0.998 percent copper. Open-pit mining at the Ray property of the Kennecott Copper Corp. was begun in January. Labor was more plentiful in 1950 than in 1949, although skilled miners continued scarce.

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by class of ore or other source material, with content in terms of recoverable metal

Source	Number of mines (1)	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold	57	10,454	2,383	5,908	39,427	14,231	24,700
Dry gold-silver	6	441	141	2,768	4,855	5,239	
Dry silver	29	48,060	968	421,192	65,305	41,513	
Total	92	58,955	3,492	429,868	109,587	60,983	24,700
Copper	106	41,757,037	79,562	2,853,375	765,334,514	5,149	10,000
Lead	91	11,791	1,271	45,235	59,932	2,652,484	34,317
Lead-copper	3	7		300	2,708	1,330	
Zinc	4	7,159	85	3,911	191,533	73,530	2,163,701
Zinc-copper	9	248,391	6,334	354,302	11,662,135	337,506	24,436,230
Zinc-lead	29	617,547	23,744	1,605,577	4,327,878	48,427,851	93,759,618
Zinc-lead-copper	2	2,515		14,791	67,107	197,912	531,434
Total	244	42,644,447	110,996	4,877,491	781,645,807	51,695,762	120,935,300
Other "lode" material:							
Old tailings, etc.[2]	11	5,870	3,683	18,082	68,485	1,009,255	
Copper precipitates	8				24,778,121		
Total "lode" material	309	42,709,272	118,171	5,325,441	806,602,000	52,766,000	120,960,000
Gravel (placer operations)	24		142				
Total: 1950	333	42,709,272	118,313	5,325,441	806,602,000	52,766,000	120,960,000
1949	372	38,372,879	108,993	4,970,736	[3] 718,020,000	67,136,000	141,316,000

[1] Detail will not necessarily add to total because some mines produce more than 1 class of ore.
[2] Old tailings: Gold-silver, 4,280 tons; lead, 1 ton. Mill cleanings: Gold, 3 tons; lead, 2 tons. Smelter cleanings: Copper, 236 tons; lead, 1,318 tons. Old slag: Lead, 30 tons.
[3] Includes 76,951,738 pounds recovered from ore leached and mine-water precipitates.

METALLURGICAL INDUSTRY

Of the 42,709,272 tons of ore produced in 1950 in Arizona, 38,466,538 tons (90 percent) were treated at 35 milling plants and 3,755,362 tons (9 percent) at 1 copper leaching plant; the remainder—487,372 tons (1 percent)—was shipped crude to smelters.

Ore treated at milling plants in 1950 comprised chiefly 37,586,791 tons of copper ore averaging 1.073 percent copper and carrying minor quantities of gold and silver per ton of ore; 613,621 tons of zinc-lead ore averaging 0.05 ounce of gold and 3.22 ounces of silver to the ton, 0.50 percent copper, 4.46 percent lead, and 9.35 percent zinc; and 248,391 tons of zinc-copper ore averaging 0.05 ounce of gold and 2.16 ounces of silver to the ton, 2.74 percent copper, 0.15 percent lead, and 3.18 percent zinc. Copper ore from the Miami property was treated by a combination of leaching and concentration and copper ore from the Inspiration mine was treated by straight leaching and by leaching and concentration. The large copper-concentration plants at Morenci (45,000-ton-a-day), Ajo (25,000-ton), Miami (18,000-ton), Inspiration (18,000-ton), Castle Dome (10,000-ton), Hayden (10,000-ton), Bagdad (4,000-ton), Clarkdale (2,100-ton), and Superior (1,500-ton); the copper-leaching plants at Inspiration (9,000-ton), and Miami (3,000-ton); and the zinc-lead concentration mills at Bisbee (Copper Queen 900-ton), Humboldt (Iron King 670-ton), Tiger (St. Anthony 500-ton), and Patagonia (Trench 200-ton) were operated continuously in 1950, most of them at a higher rate than in 1949. Operations of the Sahuarita (Eagle-Picher) 500-ton flotation mill were interrupted during November and December by a labor strike. Five copper smelters in Arizona—Phelps Dodge Corp. at Douglas and Morenci, International Smelting & Refining Co. at Miami, American Smelting & Refining Co. at Hayden, and Magma Copper Co. at Superior—operated continuously throughout the year. The old copper smelter of the Phelps Dodge Corp. at Clarkdale shut down in June, but the new copper smelter of the Phelps Dodge Corp. at Ajo began operating in July. Most of the copper concentrates produced at mills in Arizona are treated at smelters in Arizona, but all the lead concentrates produced in Arizona in 1950 were shipped to the smelter at El Paso, Tex., and all the zinc concentrates were shipped to smelters at Amarillo, Corpus Christi, and Dumas, Tex.; Bartlesville and Henryetta, Okla.; St. Louis, Mo.; and Anaconda and Great Falls, Mont.

Tables 7 to 9 give details of the treatment of ores produced in Arizona in 1950.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by method of recovery and type of material processed, in terms of recoverable metal

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Almagation: Ore	185	75			
Concentration, and smelting of concentrates: Ore	95,650	4,036,319	679,214,112	47,825,269	120,450,248
Direct smelting:					
Ore	18,653	1,270,965	36,697,582	3,931,476	509,752
Old tailings, etc	3,683	18,082	68,485	1,009,255	
Copper precipitates [1]			24,778,121		
Total	22,336	1,289,047	61,544,188	4,940,731	509,752
Other: Straight leaching of copper ore [2]			65,843,700		
Placer	142				
Grand total	118,313	5,325,441	806,602,000	52,766,000	120,960,000

[1] Distributed as follows: Cochise County, 265,000 pounds; Gila County, 11,969,931 pounds; Greenlee County, 7,163,000 pounds; Pinal County, 5,193,700 pounds; and Yavapai County, 186,490 pounds.
[2] All from 1 plant in Gila County.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal [1]

A. For ore treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
				BY COUNTIES					
Cochise	198,287	-	-	63,125	3,057	434,833	5,104,653	15,633,423	43,538,000
Gila	7,962,332	-	-	136,468	2,097	126,926	91,427,204	-	-
Graham	16,563	-	-	2,236	188	6,636	32,725	1,173,215	1,416,300
Greenlee	16,025,008	-	-	564,351	9,535	748,620	300,668,500	-	-
Maricopa	10	3	2	1	3	1	-	-	-
Mohave	12,176	-	-	2,558	76	6,569	520,763	87,035	852,320
Pima	8,862,548	33	14	245,746	37,791	655,009	129,366,278	6,015,329	11,625,550
Pinal	3,565,943	134	56	218,021	13,799	711,222	108,436,227	11,437,308	14,396,300
Santa Cruz	50,574	-	-	12,015	109	163,855	301,527	4,130,154	9,157,203
Yavapai	1,772,097	13	3	178,403	28,990	1,181,685	43,356,235	9,300,270	39,464,575
Yuma	1,000	2	-	63	5	963	-	48,535	-
Total: 1950	38,466,538	185	75	1,422,987	95,650	4,036,319	679,214,112	47,825,269	120,450,248
1949	34,482,033	40	16	1,356,558	88,257	3,904,455	602,196,907	62,507,186	140,666,862
				BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS					
Dry gold				9	140	28	641	-	-
Copper				1,228,254	70,335	2,356,420	673,960,866	68,600	101,300
Lead				50,073	15,575	1,207,061	2,627,918	41,958,577	7,166,769
Lead-copper				315	192	18,917	80,702	231,518	25,035
Zinc				117,133	4,388	377,029	2,446,465	4,798,523	111,151,624
Zinc-copper				759	20	960	51,485	22,576	601,645
Zinc-lead				7	4	83	-	4,400	1,600
Iron				26,437	4,996	75,821	46,035	741,075	1,402,275
Total 1950				1,422,987	95,650	4,036,319	679,214,112	47,825,269	120,450,248

B. For ore, old tailings, etc., shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
			BY COUNTIES			
Cochise	212,067	12,405	721,676	22,380,847	1,632,777	18,000
Coconino	400	-	106	32,100	-	-
Gila	30,627	347	14,359	1,499,865	159,000	2,500
Graham	5,106	477	9,551	53,575	1,822,985	425,700
Greenlee	94,746	992	233,313	1,546,600	1,600	-
Maricopa	129	13	6,558	18,900	12,600	-
Mohave	652	118	5,027	106,837	77,365	12,880
Pima	2,536	50	6,487	226,122	42,671	12,450
Pinal	70,795	4,982	197,657	5,584,773	806,892	2,200
Santa Cruz	736	45	8,289	10,473	103,846	17,797
Yavapai	67,933	2,483	82,953	5,264,575	121,530	7,825
Yuma	1,645	424	3,071	41,400	159,465	10,400
Total: 1950	487,372	22,336	1,289,047	36,766,067	4,940,731	509,752
1949	522,845	20,131	1,066,202	38,871,355	4,628,814	649,138
			BY CLASS OF MATERIAL			
Dry gold	4,427	1,909	4,610	36,632	4,231	-
Dry gold-silver	4,687	322	14,499	21,532	181,307	-
Dry silver	47,910	963	419,253	61,746	34,990	-
Copper	415,120	14,229	794,200	36,528,698	5,149	10,000
Lead	11,278	4,613	47,359	83,772	3,290,577	28,047
Lead-copper	7	-	300	2,708	1,330	-
Zinc-lead	3,926	300	8,732	29,809	1,415,000	469,205
Zinc-lead-copper	17	-	94	1,170	8,147	2,500
Total 1950	487,372	22,336	1,289,047	36,766,067	4,940,731	509,752

[1] Exclusive of copper ore leached and precipitates smelted.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content [1]

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE TREATED AT MILLS						
Dry gold	6,030	743	1,715	4,330	12,550	36,000
Dry gold-silver	34	17	250		1,100	
Dry silver	150	8	2,400	4,600	11,000	
Copper	37,586,791	82,465	2,644,365	806,971,010	107,300	4,596,265
Lead	1,864	91	4,520	8,754	225,655	9,877
Zinc	7,159	150	5,600	253,441	117,274	3,016,645
Zinc-copper	248,391	11,797	537,397	13,629,161	1,808,037	38,986,847
Zinc-lead	613,621	33,025	1,975,440	6,143,377	54,766,180	114,771,051
Zinc-lead-copper	2,498		15,989	86,345	210,727	621,430
Total: 1950	38,466,538	128,296	5,187,676	827,101,018	57,259,823	162,038,115
1949	34,482,033	120,671	4,898,525	722,421,667	72,732,650	181,729,887
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	9	140	28	740		
Copper	1,228,254	71,395	2,439,600	692,529,675	892,891	7,960,958
Lead	50,073	15,575	1,207,061	3,091,774	43,481,755	9,204,903
Lead-copper	315	192	18,917	94,102	242,228	32,337
Zinc	117,133	5,671	470,036	3,012,598	6,127,484	121,407,082
Zinc-copper	759	26	1,200	64,302	32,360	677,500
Zinc-lead	7	4	83		4,524	1,950
Iron	26,437	4,996	75,821	54,244	772,181	2,769,680
Total: 1950	1,422,987	97,999	4,212,746	698,847,435	51,553,423	142,054,410
1949	1,356,558	90,064	4,044,070	619,768,260	65,819,889	160,547,102
ORE, OLD TAILINGS, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold	4,427	1,909	4,610	38,008	6,036	
Dry gold-silver	4,687	322	14,499	24,624	194,556	5,506
Dry silver	47,910	963	419,253	65,349	43,069	307
Copper	415,120	14,239	794,685	38,534,609	9,372	49,450
Lead	11,278	4,613	47,359	98,238	3,397,865	43,342
Lead-copper	7		300	2,835	1,839	438
Zinc-lead	3,926	300	8,732	35,164	1,467,429	605,823
Zinc-lead-copper	17		94	1,376	8,442	3,157
Total: 1950	487,372	22,346	1,289,532	38,800,203	5,128,608	708,023
1949	522,845	20,131	1,066,202	41,287,174	4,839,614	7,019,786

[1] Exclusive of copper ore leached and precipitates smelted.

REVIEW BY COUNTIES AND DISTRICTS

COCHISE COUNTY

California District.—Output in 1950 was principally 45 tons of zinc-lead ore from the Hilltop mine and 37 tons of lead ore from the Leadville group, both near Portal.

Cochise District.—In June 1949 low metal prices closed the Republic and Mammoth mines of the Coronado Copper & Zinc Co. near Dragoon. These mines were reopened in July 1950, and milling of zinc-copper ore was begun in August. The company reported that 21,821 tons of ore, treated in its 150-ton flotation mill in 1950, yielded 1,522 tons of copper concentrate and 2,134 tons of zinc concentrate.

Dos Cabezas and Tevis District.—W. R. Shanklin worked his Gold Prince mine 9 months and shipped 2,096 tons of ore containing 758

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950 by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore, old tailings, etc. (short tons)	Gold (fine ounces)			Silver (fine ounces) [1]	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Cochise County:											
California	3		87				589	100	23,000	1,400	$3,858
Cochise	2		21,823	12		12	9,469	996,200	800	2,050,400	507,465
Dos Cabezas and Tevis	3	1	2,264	887	2	889	2,127	3,600	40,600	16,900	41,670
Smelter	(3)		493	43		43	1,653	11,800	120,200	1,100	21,838
Swisshelm	2		6,034	581		581	22,096	15,500	1,173,000		201,912
Tombstone	6		6,784	235		235	40,495	33,300	324,800	71,700	105,830
Turquoise	3		12	9		9	769	100	4,200		1,599
Warren (Bisbee)	1		372,857	13,695		13,695	1,079,311	26,689,900	15,579,600	41,414,500	14,991,760
Coconino County:											
Francis	1		5					700			146
Jacob Canyon and Warm Springs	1		395				106	31,400			6,627
Gila County:											
Banner (Christmas and Tornado)	7		24,391	257		257	6,130	1,352,200	59,200	2,500	304,148
Dripping Springs [3]	2		147	83		83	136	900	16,200		5,402
Globe-Miami	13		11,723,610	2,102		2,102	134,767	169,376,600	83,600		35,437,160
Green Valley		1			3	3					105
Mazatzal	2		2				21	100			40
Pioneer [4]	1		27	2		2	211	1,600			594
Summit	2		140				10	8.800			1,839
Tonto Basin	1		4				10	500			113
Graham County:											
Aravaipa	5		21,630	664		664	16,104	83,300	2,995,000	1,842,000	721,030
Clark	1		5					200			42
Lone Star	1		4				10	400			92
Stanley Butte	5		30	1		1	73	2,400	1,200		762
Greenlee County:											
Ash Peak	1		24,717	853		853	227,342				235,611
Copper Mountain (Morenci)	3		16,095,037	9,674		9,674	754,591	309,378,100	1,600		65,372,394
Maricopa County:											
Big Horn	1		3					500			104
Cave Creek and Camp Creek	4	1	76	7	1	8	6,456	17,500			9,763
Four Peaks	1		3					300			62
Gila Bend Mountains	1		28	8		8	32	400			392
Osborn	1		16	1		1	31		5,400		702
Pikes Peak	3		7	2		2	32		6,400		963
San Domingo		1			3	3					105
Vulture	2		3				10	100	600		111
White Picacho	1		1						200		27
White Tanks	1		2	1		1		100			56

For footnotes, see end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Arizona in 1950 by counties and districts, in term of recoverable metal—Continued

County and district	Mines producing		Ore, old tailings, etc. (short tons)	Gold (fine ounces)			Silver (fine ounces)[1]	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Mohave County:											
Bentley	1		2				10	600			$134
Cedar Valley	2		12,156	59		59	6,414	520,700	83,600	850,000	248,162
Copper Mountain	1		151	2		2	474	91,700			19,573
Cottonwood	1		1	2		2					70
Gold Basin	1		4	1		1		300			97
Lost Basin		2			7	7					245
Maynard	1		2				127		200		142
McConnico	(5)		1	20		20					700
Owens	8		157	14		14	1,896	5,900	5,400		4,162
San Francisco	1		1	4		4	11				150
Wallapai	10		332	82		82	2,643	7,900	75,200	15,200	19,215
Weaver	1		21	10		10	21	500			473
Pima County:											
Ajo	1		8,794,257	37,632		37,632	473,020	128,800,000			28,535,627
Amole	1		38	1		1	10	1,000			252
Baboquivari	3		314	172		172	327	5,000			7,356
Cababi	1		257	27		27	31	100	1,000		1,129
Cerro Colorado	1		89	1		1	2,812	500	1,600		2,900
Empire	1		253	4		4	453	600	51,200	4,200	8,183
Greaterville		1			3	3					105
Helvetia (Rosemont)	4		1,514				1,717	177,800	9,000	7,200	40,773
Pima (Sierritas, Papago, Twin Buttes)	6		67,573	34		34	182,540	564,100	5,992,800	11,604,300	2,740,570
Rincon	1		4				10		800		117
Silver Bell	1		785	3		3	590	43,300	1,600	22,300	13,028
Pinal County:											
Casa Grande	3		12,459	10		10	109,301	200	5,400	2,200	100,356
Cottonwood	3		52	11		11	1,105	1,100			1,614
Dripping Springs[3]	3		85	3		3	443	2,400	19,600		3,651
Goldfields	1		4,800	94		94	42				3,328
Mineral Creek (Ray)	4		3,071,860	683		683	130,669	72,884,200	119,200		15,318,173
Mineral Hill	5		163	38		38	178	6,700	11,000		4,370
Old Hat	8		116,479	3,674		3,674	137,611	1,029,800	11,959,800	9,206,300	3,389,201
Owl Head	2		456	6		6	137	16,300			3,724
Picacho	1		16				10	1,800			383
Pioneer (Superior)[4]	4		430,284	14,392		14,392	529,186	45,271,200	123,200	5,190,000	11,152,682
Ripsey	1		14				52	100	1,200		230
Riverside	1		34				10	900			196
Rogers	1		25	4		4	11		4,400		744
Saddle Mountain	1		10				53				48
Vekol	1		1				127		400		169

Santa Cruz County:											
Harshaw	4		46,738	109		109	147,258	198,900	3,861,400	8,386,900	1,890,691
Nogales	1		2	1		1	10				44
Oro Blanco	4		474	37		37	4,707	4,200	76,000	37,500	22,014
Pajarito	1		56				84	200	9,400		1,387
Palmetto	5		90	5		5	515	5,300	1,400		1,932
Patagonia (Duquesne)	6		3,667				16,925	101,800	236,000	736,500	172,935
Redrock	1		5				53		600		129
Tyndall	6		250	1		1	2,181	700	48,400	14,100	10,691
Wrightson	3		28	1		1	411	900	800		702
Yavapai County:											
Big Bug	5	3	203,172	19,319	9	19,328	701,973	459,700	8,713,800	20,831,800	5,541,898
Black Canyon	5	1	43	19	3	22	253	100	1,000	400	1,212
Black Hills	1		57	1		1	327	1,000	5,800		1,322
Black Rock	6		330	66		66	327	10,500	200		4,817
Blue Tank		2			2	2					70
Copper Basin	3		4,799	7		7	431	285,800	6,600	20,900	63,940
Copper Creek	1		10				10	1,000			217
Eureka (Bagdad)	12		1,267,235	1,776		1,776	93,966	21,345,300	425,600	2,956,600	5,064,319
Hassayampa	6	1	415	89	1	90	2,832	10,600	141,800	36,400	32,230
Humbug	2		58	17		17	684	400	600		1,378
Lynx Creek		2			2	2					70
Martinez	1		267	75		75	169				2,778
Peck	2		7	1		1	684		1,200		816
Pine Grove	3		1,197	506		506	3,623	7,200	12,400	24,700	27,668
Silver Mountain	2		24	1		1	1,296		200		1,235
Tiger	2		4	3		3	22		600		206
Tip Top	1		831	62		62	969	97,500			23,327
Turkey Creek	2		16	1		1	569		5,400		1,279
Verde (Jerome)	2		361,320	9,421		9,421	456,254	26,581,400	100,000	15,600,000	8,500,299
Walker	2		37	13		13	84		4,400	1,600	1,352
Walnut Grove	7		86	6		6	105	6,800	1,400		1,908
Weaver	6	1	122	103	8	111	63		800		4,050
Yuma County:											
Castle Dome	10		977	7		7	1,053		51,200		8,110
Cienega	6		614	166		166	85	27,900			11,690
Dome (Gila City)		1			2	2					70
Ellsworth (Harqua Hala)	12		357	132		132	600	6,500			6,515
Kofa Mountains and Tank Mountains	1		1	11		11					385
Laguna	1		2	3		3					105
LaPaz		1			3	3					105
Middle Camp		1			1	1					35
Mineral Hills Wash	1		9					600			125
Plomosa	7	2	648	102	16	118	2,286	4,600	156,800	10,400	29,801
Santa Maria	2		37	10		10	10	1,800			733
Trigo		2			76	76					2,660
Total Arizona	309	24	42,709,272	118,171	142	118,313	5,325,441	806,602,000	52,766,000	120,960,000	201,033,694

[1] All from lode mines.
[2] Not counted as mine, production coming from smelter cleanings and railroad-track clean-up.
[3] Dripping Springs district lies in both Gila and Pinal Counties.
[4] Pioneer district lies in both Gila and Pinal Counties.
[5] Not counted as mine, production coming from old mill cleanings.

232294—53—89

ounces of gold, 955 ounces of silver, 2,427 pounds of copper, and 5,602 pounds of lead. The rest of the district lode output was 167 tons of zinc-lead ore produced from the LeRoy Consolidated Mines and a small lot of gold ore from the Mary Joe No. 6 claim.

Smelter District.—Output in 1950 was 440 tons of lead residue shipped from the Phelps Dodge Corp. copper smelter at Douglas, Ariz., and 53 tons of railroad-track cleanings shipped by Frank Allen.

Swisshelm (Elfrida) District.—In 1950 Edwin Larson shipped 5,238 tons of lead ore from his Scribner mine near Elfrida, and the Chance Mining Co. shipped 791 tons of lead ore and 5 tons of lead-copper ore from its Chance group. The ore from both mines contained 581 ounces of gold, 22,096 ounces of silver, 17,867 pounds of copper, 1,217,200 pounds of lead, and 2,738 pounds of zinc.

Tombstone District.—Output in 1950 comprised 4,280 tons of low-grade gold-silver tailings shipped from the Grand Central dump; 1,195 tons of low-grade silver fluxing ore shipped from the San Pedro property; 870 tons of silver-lead ore produced from the Tombstone and Tombstone Extension groups; 436 tons of zinc-lead ore from the Brother George mine of the Mary Jo group; and 3 tons of lead ore from the San Diego claim.

Turquoise (Courtland, Pearce, Gleeson) District.—After the Abril and San Juan zinc mines closed in 1949, the output of the Turquoise district was small; in 1950 it consisted of only 12 tons of silver-lead ore produced from the Garnet, Johnny Boy, and X X X properties.

Warren (Bisbee) District.—Despite a marked drop in output of zinc-lead-silver ore in 1950, the Warren district remained the largest producer of silver, lead, and zinc in Arizona and ranked fourth in gold and sixth in copper. The copper output increased 36 percent and the gold 16 percent from 1949, but the lead output declined 44 percent, zinc 41 percent, and silver 7 percent. The value of the metal output of the district decreased from $18,505,611 in 1949 to $14,991,760 in 1950. The quantity of zinc-lead ore mined at the Copper Queen mine of the Phelps Dodge Corp. was much less than in 1949; but that of copper ore was greater, owing to resumption of copper mining, which had been suspended in June 1949. The corporation reported that the Copper Queen branch produced 218,404 tons of copper ore and 153,730 tons of zinc-lead ore in 1950 compared with 138,413 and 280,742 tons, respectively, in 1949. In addition, 355 tons of copper precipitates were produced. The zinc-lead ore and 19,871 tons of copper ore were treated in the corporation 900-ton flotation mill at Bisbee; the remainder of the copper ore and the copper precipitates were shipped direct to the corporation smelter at Douglas.

According to the corporation annual report for 1950, approaching exhaustion of zinc-lead ore at the Copper Queen branch and favorable economic conditions in the copper industry caused operations to be converted during the year from zinc-lead production to the mining of copper ore. Smelter copper production in 1950 was 21,203,333 net pounds compared with 21,864,907 net pounds in 1949; lead produced totaled 11,606,250 net pounds compared with 20,718,742 net pounds; and zinc produced totaled 33,423,374 net pounds compared with 56,685,269 net pounds.

COCONINO COUNTY

Lessees continued to operate the open pit of the Petoskey mine in the Jacob Canyon (Warm Springs) district and shipped 395 tons of carbonate copper ore containing 106 ounces of silver and 32,266 pounds of copper; 5 tons of similar ore were produced from the Emerald claim in the Francis district.

GILA COUNTY

Banner (Christmas and Tornado) District.—The Sam Knight Mining Lease, Inc., worked the Christmas mine all year and shipped high-lime fluxing ore (24,007 tons) containing an average of 2.86 percent copper to the copper smelter at Hayden, where it was needed for fluxing. Other district production comprised 234 tons of lead ore produced from the Kullman-McCool and London-Arizona groups, 82 tons of copper ore from the Chilito, London-Arizona, and "79" mines, 51 tons of gold ore from the Javoncillo and Round Top mines, and 17 tons of zinc-lead ore from the "79" mine.

Dripping Springs District.—Output in 1950 was 86 tons of lead ore and 29 tons of gold ore from the C–B claim and 32 tons of gold ore from the Gold Queen mine.

Globe-Miami District.—The Globe-Miami district, with a production of 169,376,600 net pounds of copper in 1950 (160,377,000 net pounds in 1949), continued to rank second among the important copper-producing areas in Arizona; the Copper Mountain (Morenci) district in Greenlee County remained in first place. The Inspiration property, with a yield of 77,025,822 net pounds of copper (62,805,750 net pounds in 1949), remained the leading copper producer in the district and ranked third in the State. The Inspiration Consolidated Copper Co. reported that 4,027,697 tons of copper ore were treated in 1950 compared with 3,619,906 tons in 1949. Of the total ore, 3,755,362 tons, averaging 1.008 percent copper—0.505 percent copper as oxide and 0.503 percent as sulfide—from which the slimes had been removed, were treated by acid ferric sulfate in the main leaching plant. Slimes (268,561 tons averaging 1.487 percent copper) removed from ore at the main leaching plant were treated in the company flotation concentrator for extraction of the sulfide copper content, and the tailings from the operation were leached by sulfuric acid solution for extraction of the oxide copper content. In addition, 3,774 tons of crude copper ore and 51 tons of copper precipitates were sent direct to the smelter at Miami. The total copper production per ton of ore treated in 1950 was 17.75 pounds.

According to the annual report of the Inspiration company for 1950, operations were conducted continuously on a 6-day-per-week basis, and leaching-in-place operations were begun the latter part of April. Production from this source was 4,178,194 net pounds of copper. Ore was produced from both underground and open-pit operations—2,114,423 tons of ore averaging 1.008 percent copper were mined from underground and 1,898,666 tons averaging 1.076 percent copper from the open pit. In addition to mining copper ore, open-pit operations also included removal of 4,228,273 tons of waste, a waste-ore ratio of 2.22:1.

The Miami mine of the Miami Copper Co. and the Castle Dome Copper Co., Inc. (a wholly owned subsidiary of the Miami Copper Co.), ranked second and third, respectively, in copper production in the district. The Miami Copper Co. reported that 91,364,999 net pounds of copper were produced from the two properties in 1950 (46,569,293 net pounds from the Miami mine and 44,795,706 net pounds from the Castle Dome) compared with 96,553,259 net pounds in 1949.

According to the annual report of the Miami Copper Co. for 1950, both properties operated on a 6-day-per-week basis throughout the year. Although the combined tonnage of copper ore mined and concentrated at the two plants exceeded that in 1949, less copper was recovered because lower-grade ore was handled. Copper was produced at the Miami mine by underground mining followed by flotation and by acid leaching of material overlying the mined-out areas. The 18,000-ton concentrator treated 4,003,306 tons of ore averaging 0.667 percent copper; 72,889 tons of copper concentrate and 2,831 tons of copper precipitates were shipped to smelters in Arizona. In addition to copper, the concentrate contained 1,129 ounces of gold and 54,463 ounces of silver, and re-treatment of copper concentrate recovered 627,288 pounds of molybdenum. Ore reserves, as of January 1, 1951, were estimated to be 18,609,263 tons averaging 0.78 percent copper. The Castle Dome open pit and 10,000-ton concentrator were operated continuously in 1950; the mill treated 3,690,465 tons of ore averaging 0.704 percent copper, which yielded 61,628 tons of copper concentrate. In addition to copper, the concentrate contained 935 ounces of gold and 69,635 ounces of silver. To uncover the ore, it was necessary to remove 855,419 tons of waste. As of January 1, 1951, ore reserves were estimated to be 10,032,618 tons averaging 0.665 percent copper, including Red Hill ore and a block of low-grade ore lying between the 4,040- and 4,085-foot levels of the Castle Dome ore body. An agreement was made to deliver the Castle Dome plant and mining equipment to the Copper Cities Mining Co. (wholly owned subsidiary of Miami Copper Co.) project in the Globe-Miami district at termination of the Castle Dome operations. A copper deposit amenable to open-pit mining and comparable in size and grade to the Castle Dome ore body was outlined in 1949 at the Copper Cities property.

The rest of the district output was largely 1,150 tons of low-grade silver ore shipped from the Rescue property and 849 tons of copper ore from the Black Beauty, Blue Bird, Copper Hill, and Keystone claims of the Old Dominion group, and Superior & Boston properties.

Summit District.—The Gibson and Yan mines near Miami together produced 140 tons of copper ore in 1950.

GRAHAM COUNTY

Aravaipa District.—The Athletic Mining Co. operated its Aravaipa group and 100-ton concentrator near Klondyke continuously in 1950. The company reported that 16,263 tons of zinc-lead ore were treated by flotation and 2,990 tons of similar ore shipped direct to the lead smelter at El Paso, Tex. The total ore contained 372 ounces of gold, 27,230 ounces of silver, 125,625 pounds of copper, 2,793,900 pounds of lead, and 2,790,000 pounds of zinc. Lessees worked the Sein Fein mine all year, shipped 1,238 tons of lead ore to a smelter, and hauled 300 tons of similar ore to the Athletic mill. The total ore contained 419 ounces of gold, 3,542 ounces of silver, 34,640 pounds of copper, and 480,326 pounds of lead. Other district production included 503 tons of zinc-lead ore from the Santa Teresa group and 336 tons of lead ore from the Abe Reed and Ben Hur properties.

Stanley Butte District.—Output in 1950 was 27 tons of copper ore produced from the Copper Chief, Copper Hill No. 4, and Silver Star claims and 3 tons of lead ore from the Legal Tender and Starlight claims.

GREENLEE COUNTY

Ash Peak District.—Ash Peak Lease worked the Ash Peak mine near Duncan all year and shipped to smelters in Arizona and Texas 24,717 tons of fluxing ore, averaging 0.035 ounce of gold and 9.198 ounces of silver to the ton and 80 percent silica.

Copper Mountain (Morenci) District.—The Copper Mountain district, with an output of 309,378,100 net pounds of copper in 1950 (283,867,000 net pounds in 1949), remained the chief copper-producing area in Arizona, as the Morenci mine of the Phelps Dodge Corp. continued to be the outstanding producer of copper in the State. The corporation reported that 16,025,008 tons of copper ore from the Morenci mine was treated in the 45,000-ton concentrator in 1950, compared with 14,488,723 tons in 1949, and that 564,351 tons of copper concentrate, 69,850 tons of crude copper ore, and 4,723 tons of copper precipitates were shipped direct to the Morenci smelter. In addition to copper, the mine was an important producer of gold and silver.

According to the annual report of the Phelps Dodge Corp. for 1950, the Morenci mine was operated throughout the year at a high rate, and a 6-day workweek was in effect until April 16, when operations were increased to a work schedule of 26 consecutive days followed by a 2-day shut-down. Copper ore mined totaled 16,094,858 tons, and waste and leach material removed, 26,734,814 tons, or a waste-ore ratio of 1.66 : 1. The experimental unit used to treat a portion of the copper concentrate for recovery of molybdenite operated throughout the year. The results, although erratic, were on the whole encouraging. It was hoped that during 1951 a marketable molybdenite concentrate would be produced.

Other district production was 179 tons of gold-silver smelting ore from the Bell and Climax Lode properties.

MARICOPA COUNTY

Cave Creek and Camp Creek District.—Output in 1950 was principally 63 tons of ore containing 6,443 ounces of silver and 17,596 pounds of copper produced from the Red Rover mine.

Osborn District.—Glenn D. Brubaker worked the General Grant claim 5 months and hauled 16 tons of lead ore to the Wickenburg Ore Market.

MOHAVE COUNTY

Cedar Valley District.—The 100-ton flotation mill of the Yucca Mining & Milling Co. at the Antler mine operated continuously in 1950 on zinc-copper ore from the Antler and Copper World mines near Yucca. The Antler mine, worked all year by the Yucca Mining & Milling Co., produced 10,648 tons of ore, and the Copper World mine, worked part of the year by Dye & Bathrick, produced 1,508 tons of ore. The total ore contained an average of 0.01 ounce of gold and 1.08 ounces of silver to the ton, 2.60 percent copper, 0.95 percent lead, and 6.48 percent zinc.

Copper Mountain District.—Lessees operated the Cox-Roth (Copper Mountain) property in 1950 and shipped 151 tons of ore containing 2 ounces of gold, 474 ounces of silver, and 94,000 pounds of copper.

Owens (McCracken and Potts Mountain) District.—Output in 1950 was 135 tons of copper ore produced from the Silverfield group and small lots of lead-silver ore, gold ore, and copper ore produced from various claims and sold to the Wickenburg Ore Market.

Wallapai (Cerbat, Chloride, Mineral Park, Stockton Hill) District.—Mining activity in the Wallapai district in 1950 was small compared with that in past years. The output consisted mainly of 137 tons of zinc-lead ore produced from the DeLaFountaine and Samoa groups, 85 tons of copper ore from the Detroit and Emerald Isle mines, 60 tons of lead ore from the St. Louis and Eagle mines, and 28 tons of gold-silver ore from the Hidden Treasure group.

PIMA COUNTY

Ajo District.—The Ajo district continued to rank first in gold and third in copper output in the State, owing to steady operation of the New Cornelia copper mine of the Phelps Dodge Corp. Copper ore treated in 1950 was 8 percent greater than in 1949. According to the annual report of the Phelps Dodge Corp. for 1950, the New Cornelia mine produced 8,790,024 tons of copper ore in 1950 compared with 8,122,473 tons in 1949. Waste removed totaled 8,794,909 tons compared with 5,700,740 tons in 1949. The company 25,000-ton concentrator treated 8,794,257 tons of copper ore, which yielded 131,717,340 net pounds of copper compared with 115,744,833 net pounds in 1949. A 6-day workweek was in effect until April 16, when operations were increased to a work schedule of 26 consecutive days followed by a 2-day shut-down. Construction of the new copper smelter at Ajo was completed in June, and smelting of New Cornelia concentrates was begun July 8.

Baboquivari District.—Leasers at the Papago Chief mine near Sells produced 160 tons of low-grade copper ore. L. J. Robison worked the Emmett & Elgin group and treated by concentration about 150 tons of gold ore, which yielded 6 tons of concentrate containing 135 ounces of gold, 26 ounces of silver, and 740 pounds of copper. Other district production was mainly old mill cleanings (gold) recovered from the mill at the Allison mine.

Cababi District.—Low-grade gold ore (254 tons) from the Cunquian mine near Sells was treated in a concentration mill by Picacho Mines, Inc., and 3 tons of high-grade gold ore were shipped to smelters.

Cerro Colorado District.—Lessees continued to work the Mary G mine near Amado and shipped 89 tons of silver ore to the smelter at El Paso, Tex.

Empire District.—E. P. Hilton worked his Lone Mountain group in 1950, treated 206 tons of lead ore in a concentration mill, and shipped 47 tons of similar ore direct to a lead smelter.

Helvetia (Rosemont) District.—Lessees worked the King in Exile mine all year and shipped 1,288 tons of ore containing 1,483 ounces of silver, 171,013 pounds of copper, and 3,550 pounds of lead. Other production was 43 tons of zinc-lead ore and 35 tons of copper ore from the Daylight mine and 148 tons of copper ore from the Forbes and Peach properties.

Pima (Sierritas, Papago, Twin Buttes) District.—Production of silver, copper, lead, and zinc in the Pima district in 1950 was less than in 1949, owing to a labor strike in November and December at the San Xavier property of the Eagle-Picher Mining & Smelting Co., one of the most important producers of zinc-lead ore in Arizona. The company reported that the mine produced 67,456 tons of zinc-lead ore in 1950 compared with 82,661 tons in 1949. This ore and 183 tons of custom ore were treated in the company 500-ton flotation mill; the yield was 10,585 tons of zinc concentrate and 5,459 tons of lead concentrate. Other district production included 49 tons of gold ore from the Golden Fleece mine and 33 tons of zinc-lead ore from the Paymaster.

Silver Bell District.—B. S. & K. Mining Co. operated the Atlas mine the last 5 months of 1950 and shipped 785 tons of ore containing 3 ounces of gold, 600 ounces of silver, 45,258 pounds of copper, 2,300 pounds of lead, and 63,636 pounds of zinc.

PINAL COUNTY

Casa Grande District.—Sherwood B. Owens worked the Silver Reef mine all year and shipped 12,445 tons of siliceous silver fluxing ore to smelters in Arizona and Texas. The Silver Lake mine produced 12 tons of zinc-lead ore and the Lead King claim 2 tons of high-grade silver-lead ore.

Cottonwood District.—Output in 1950 was 38 tons of gold ore produced from the Grand View group, 7 tons of copper ore from the Holy Cross claim, and 7 tons of silver ore from the Old Sample No. 11 claim.

Dripping Springs District.—In 1950 the output of the Dripping Springs district in Pinal County was mainly 47 tons of copper-silver ore produced from the Monitor mine near Ray and 35 tons of lead ore from the Lead Queen mine.

Goldfields District.—Operations at the old Mammoth property near Apache Junction by Goldfield Mines, Inc., included construction of a 100-ton amalgamation-flotation mill and treatment of 4,800 tons of low-grade gold ore.

Mineral Creek (Ray) District.—The Ray property of the Kennecott Copper Corp., one of the most important producers of copper ore in Arizona, increased its output of copper ore to 3,063,703 tons in 1950—a gain of 1,513,969 tons (98 percent) over 1949. The milling ore (3,056,425 tons), averaging 1.368 percent copper, was coarse-crushed in a 12,000-ton crushing plant at the mine, and the resulting product was hauled by rail 26 miles to the corporation 10,000-ton flotation mill at Hayden, where it was reduced to 115,004 tons of concentrate containing 666 ounces of gold, 130,000 ounces of silver, and 68,004,040 pounds of copper. In addition, 7,278 tons of crude smelting ore and 3,167 tons of copper precipitates, which together contained 5,594,141 pounds of copper, were produced. According to the annual report of the Kennecott Copper Corp. for 1950, the Ray Mines division produced 1,628,921 tons of copper ore by open-pit mining and 1,427,504 tons by underground mining. The work of converting a large part of the Ray mining activities from underground to open-pit operation has progressed to the extent that current open-pit production is approximately 8,000 tons a day.

The remaining district output was 7,858 tons of oxide ore, averaging 2.813 percent copper, produced from the Copper Butte open pit, and 299 tons of oxide lead ore from the Ray Silver-Lead and Richard Arlyn properties.

Mineral Hill District.—Output in 1950 was mainly 86 tons of copper ore from the Junction and Tom Thumb mines, 33 tons of gold ore from the Thanksgiving mine, and 27 tons of lead ore from the Silver King.

Old Hat (Oracle) District.—Although the output of zinc-lead ore from the Mammoth-Collins group of the St. Anthony Mining & Development Co., Ltd., at Tiger was 19 percent less in 1950 than in 1949, the property remained one of the most important producers of zinc and lead in Arizona. The company reported that 115,357 tons (142,500 tons in 1949) of ore, averaging 0.003 ounce of gold and 1.230 ounces of silver to the ton, 0.64 percent copper, 5.69 percent lead, and 5.65 percent zinc, were treated in its 500-ton gravity-flotation mill in 1950. In addition, 32 tons of lead ore and 814 tons of old smelter cleanings, containing 3,435 ounces of gold, 4,294 ounces of silver, 31,056 pounds of copper, and 661,819 pounds of lead were shipped to smelters. The rest of the district output was mainly 150 tons of silver ore produced from the Amphitheater group, 71 tons of gold ore from the Golden Dream and Southern Belle properties, and 49 tons of lead ore from the Stove Lid claim.

No ore was produced in 1950 from the San Manuel property of the San Manuel Copper Corp. (wholly owned subsidiary of Magma Copper Co.) south of Tiger, where extensive diamond drilling has outlined an ore body estimated to contain 462,784,500 tons of ore averaging 0.782 percent copper. According to the annual report of the Magma Copper Co. for 1950, the No. 1 shaft at the San Manuel property was sunk an additional 193 feet and the No. 2 shaft an additional 744 feet. Metallurgical testing was done continuously throughout the year to obtain data for designing a reduction and concentration plant. This work proved the ore to be readily amenable to standard methods of concentration, and company engineers have been drafting plans for a complete plant, as well as for developing and mining the ore body.

Owl Head District.—Lessees worked the Blue Copper and Desert mines in 1950 and shipped 456 tons of ore containing 6 ounces of gold, 137 ounces of silver, and 17,002 pounds of copper.

Pioneer (Superior) District.—The Magma mine (Magma Copper Co.), one of the most important producers of gold, silver, and copper in Arizona, became an important producer of zinc again in July 1950 (zinc mining had been suspended since July 1945). The company reported that 338,533 tons of copper ore and 50,527 tons of zinc-copper ore were milled in its 1,500-ton concentrator in 1950 and that 33,313 tons of copper ore and 6,342 tons of siliceous silver ore were shipped direct to its copper smelter at Superior. The copper milling ore averaged 0.031 ounce of gold and 1.080 ounces of silver a ton, and 6.146 percent copper; the zinc-copper ore averaged 0.019 ounce of gold and 2.543 ounces of silver a ton, 1.413 percent copper, 1.200 percent lead, and 8.453 percent zinc. According to the company annual report for 1950, the net metal produced from Magma crude smelting ore and concentrates comprised 14,257 ounces of gold, 517,518 ounces of silver, and 48,285,474 pounds of copper; 5,508 tons of zinc concentrate, averaging 50.451 percent zinc, were produced during the last 6 months of the year. The average cost of producing copper (after gold, silver, and zinc values were deducted) was 14.61 cents a pound in 1950 compared with 17.94 cents in 1949.

The rest of the district output was principally 950 tons of silver ore and 25 tons of lead-silver ore from the Reymert mine and 577 tons of low-grade gold-copper ore from the Lake Superior & Arizona group.

SANTA CRUZ COUNTY

Harshaw District.—In 1950 four properties in the Harshaw district produced 46,738 tons of ore containing 150 ounces of gold, 159,116 ounces of silver, 280,649 pounds of copper, 4,214,376 pounds of lead, and 9,741,578 pounds of zinc. Most of the output was 46,365 tons of zinc-lead-silver ore produced from the Flux mine near Patagonia by the American Smelting & Refining Co. This tonnage, along with 4,289 tons of ore received from custom shippers, was treated in the company 200-ton flotation mill; the yield was 3,210 tons of lead concentrate and 8,893 tons of zinc concentrate. Other district production was chiefly 307 tons of lead ore from the Blue Nose mine and 65 tons of silver ore from the Hermosa.

Oro Blanco (Ruby) District.—Hugo W. Miller operated his Montana group a short time in 1950 and shipped 190 tons of ore containing 21 ounces of gold, 2,752 ounces of silver, 3,020 pounds of copper, 37,331 pounds of lead, and 7,963 pounds of zinc. Other production included 158 tons of zinc-lead ore from the Choctaw mine and 91 tons of lead ore and 28 tons of zinc-lead ore from the Arizona group.

Pajarito District.—The Big Steve mine near Nogales produced 56 tons of lead ore.

Palmetto District.—Copper ore (86 tons) was shipped in 1950 from the Jack Pot waste dump and La Esperanza mine. Other production comprised small lots of lead ore from the Black Butte, Chloride, and Taft No. 4 claims.

Patagonia (Duquesne) District.—In 1950 six mines in the Patagonia district produced a total of 3,667 tons of ore containing 18,419 ounces of silver, 133,112 pounds of copper, 261,315 pounds of lead, and 867,510 pounds of zinc. A. R. Byrd, Jr., worked his Duquesne group all year and hauled 2,498 tons of ore, averaging 6.40 ounces of silver to the ton, 1.73 percent copper, 4.22 percent lead, and 12.44 percent zinc, to a custom flotation mill near Patagonia. The remaining district output was chiefly 626 tons of zinc ore produced from the Kansas mine and 466 tons of zinc-copper ore from the Pride of the West mine, treated in the Trench flotation mill near Patagonia.

Tyndall District.—The Bull Springs mine produced 179 tons of ore containing 2,119 ounces of silver, 362 pounds of copper, 37,229 pounds of lead, and 14,940 pounds of zinc. Other district production was mainly 64 tons of lead ore from the Bohlinger, Jefferson, and San Ramon properties.

YAVAPAI COUNTY

Big Bug District.—The metal output in the Big Bug district in 1950 was much greater than in 1949 owing to a substantial increase in output of zinc-lead-iron ore from the Iron King mine of the Shattuck Denn Mining Corp., which ranked second in gold and zinc production in the State and third in silver and lead. The corporation reported that 203,062 tons of ore, which averaged 0.134 ounce of gold and 4.453 ounces of silver to the ton, 0.169 percent copper, 2.621 percent lead, 6.949 percent zinc, and 22 percent iron, were treated in 1950 in its 670-ton flotation mill, which also treated 458 tons of custom ores. The mill product was 14,912 tons of lead concentrate, 19,972 tons of zinc concentrate, and 26,556 tons of iron-gold concentrate. According to the annual report of the corporation for 1950, the Iron King mine produced more ore in 1950 than in any previous year. The main shaft was sunk an additional 243 feet to a depth of 1,713 feet.

The remainder of the district lode output was chiefly 73 tons of gold ore from the M. & W. claim and 28 tons of copper ore from the Lone Pine mine. Placer gold (9 ounces) was recovered from three properties on Big Bug Creek.

Black Canyon District.—The most important district output was 34 tons of gold-silver ore from the Golden Turkey mine near Cleator.

Black Hills District.—Vern J. Huffaker worked the Shylock mine near Dewey in 1950 and shipped 57 tons of lead ore.

Black Rock District.—The Camp B. Mining Co. operated the Monte Cristo mine near Wickenburg in 1950 and treated about 300 tons of copper-gold ore by flotation. Small lots of copper ore and gold ore were produced from various claims and sold to the Wickenburg Ore Market.

Copper Basin District.—Fred D. Schemmer operated the Copper Basin group near Skull Valley until May 6, when the mine was shut down. During the time of operation, 4,666 tons of high-silica copper ore was shipped to the United Verde smelter at Clarkdale. The "U. S. Navy" mine produced 30 tons of zinc-lead ore and the Boston-Arizona group 103 tons of zinc ore.

Eureka (Bagdad) District.—In 1950, 12 mines in the Eureka district produced 1,267,235 tons of ore containing 2,150 ounces of gold, 110,799 ounces of silver, 29,355,803 pounds of copper, 534,857 pounds of lead, and 4,053,445 pounds of zinc—a 17-percent gain in ore output over

1949. The most important output was, as in 1949, copper ore produced from the open pit at the Bagdad mine by the Bagdad Copper Corp. The corporation reported that 1,250,892 tons of ore, averaging 1.158 percent copper, were treated in its 4,000-ton (capacity increased from 3,000 tons) flotation mill in 1950 compared with 1,058,311 tons in 1949. The 150-ton flotation mill of the Hillside Mining & Milling Co. operated all year on company ore and custom ores. The mill treated 7,750 tons of ore from the Hillside mine that averaged 0.25 ounce of gold and 4.35 ounces of silver to the ton, 0.32 percent copper, 2.41 percent lead, and 2.42 percent zinc; and 7,997 tons of ore from custom shippers in the district. Edgar Kellis (lessee) worked the Old Dick mine all year and hauled to the Hillside mill 6,330 tons of ore that contained an average of 0.02 ounce of gold and 0.71 ounce of silver to the ton, 1.82 percent copper, 0.75 percent lead, and 22.59 percent zinc. In addition, 22 tons of copper ore were shipped to a smelter. Other production included 2,140 tons of zinc-copper ore from the Copper King, Copper Queen, and Pinafore properties and 81 tons of zinc-lead ore and 17 tons of lead ore from the Desert Rose, Goodwin, and Vidano claims.

Hassayampa (Groom Creek, Hassayampa River, Senator, Prescott) District.—Jack Orr worked the Cash mine the first 6 months of 1950 and produced 226 tons of ore, which averaged 0.212 ounce of gold and 9.261 ounces of silver to the ton, 2.22 percent copper, 16.24 percent lead, and 9.88 percent zinc. The remainder of the district output was principally 136 tons of gold-lead ore from the Bodie mine and 39 tons of zinc-lead ore from the Ten Spot.

Humbug District.—Output in 1950 was 32 tons of gold-silver ore shipped from the Golden Anchor mine and 26 tons of silver ore from the Coberley claim.

Martinez (Congress) District.—Lessees at the old Congress mine shipped 267 tons of high-silica gold ore to the smelter at Hayden.

Pine Grove (Crown King) District.—About 660 tons of gold ore produced from the Gladiator mine in 1950 was treated in a flotation mill, and 516 tons of similar ore was shipped direct to the smelter at Miami. The total ore contained 515 ounces of gold, 3,850 ounces of silver, 8,167 pounds of copper, 11,250 pounds of lead, and 36,000 pounds of zinc. Other output included 20 tons of gold-lead ore from the Del Pasco group.

Silver Mountain District.—Output in 1950 was nearly all silver ore (23 tons) produced from the Little Joker claim near Wagoner.

Tip Top (Rock Springs) District.—The Black Canyon Copper Co., Inc., worked the Kay mine all year and shipped 831 tons of ore containing 62 ounces of gold, 969 ounces of silver, and 101,095 pounds of copper.

Turkey Creek District.—The Oro Fino claim produced 5 tons of high-grade silver-lead ore and the Senator claim 11 tons of silver ore and lead ore.

Verde (Jerome) District.—Production of zinc gained sharply (79 percent) in the Verde district in 1950 owing to a 45-percent increase in output of zinc-copper ore from the United Verde mine of the Phelps Dodge Corp.; however, the district production of gold, silver, and copper declined as a result of a material decrease (33 percent) in output of copper ore from the United Verde mine. The Phelps Dodge Corp. reported that the mine produced 199,803 tons of copper ore and 161,281 tons of zinc-copper ore in 1950 compared with 297,161 and 111,290 tons, respectively, in 1949. All the zinc-copper ore and 139,173 tons of copper ore were treated in the corporation 2,100-ton flotation mill. The copper concentrate (65,404 tons), plus 60,630 tons of crude copper ore and 139 tons of copper precipitates, was shipped direct to the corporation smelters at Ajo and Clarkdale. The zinc concentrate (18,489 tons) was shipped to a zinc smelter at Dumas, Tex.

According to the annual report of the corporation for 1950, the United Verde branch produced 25,759,366 net pounds of copper in 1950 compared with 34,477,880 net pounds in 1949; and 15,157,169 pounds of zinc were recovered compared with 8,005,488 pounds in 1949. No important ore discoveries were made; and, because of rapidly depleting ore reserves, the copper smelter at Clarkdale was closed June 6. The probabilities are that, owing to lack of ore reserves, mining will be discontinued by the end of 1951.

The remainder of the district output was 236 tons of old smelter cleanings shipped from the United Verde Extension copper-smelter site and 2 tons of copper precipitates from the Verde Exploration property.

Walker District.—Zinc-lead ore (35 tons) was produced from the Forshada mine and gold ore (2 tons) from the Gold Coin group.

Walnut Grove District.—Leasing operations at the McMahon group near Wagoner produced 73 tons of copper ore. Small lots of gold ore, copper ore, and lead ore were produced from various claims and sold to the Wickenburg Ore Market.

Weaver (Octave) District.—Output in 1950 was principally 119 tons of crude gold ore shipped to smelters from the Dutchman, Monica, and Octave mines.

YUMA COUNTY

Castle Dome District.—Desert Lead Co. operated the Hull mine 7 months and treated 928 tons of lead ore in a 50-ton gravity-concentration mill. Small lots of lead ore were produced from the Adams, Johnnie Lead, Minot, Orpha, Ruth Ann, Shirley Lee, and Sonora properties.

Cienega District.—Leasing operations at the Empire-Arizona group near Parker by the Lucky Tiger Combination Gold Mining Co. produced 416 tons of ore containing 96 ounces of gold, 40 ounces of silver, and 18,580 pounds of copper. Gold-copper ore (155 tons) was shipped from the Laura, Mammon, and Oro properties. Other production included 40 tons of gold ore from the Billy Mack mine treated by amalgamation and concentration.

Ellsworth (Harqua Hala) District.—J. W. Stewart shipped 168 tons of low-grade gold-silver-copper ore from the Bettle No. 1 claim.

Gold ore (169 tons) was shipped by lessees from the Blue Eagle, Blount El Tigre, Harqua Hala, Hercules, and Magic properties. The Big Chief, Bonanza, Desert, Mickey Doolan, and Mother Lode claims together produced 20 tons of copper ore.

Plomosa District.—The Southern Cross Mining Corp. worked the Lucky Lead group near Bouse all year and shipped 485 tons of ore containing 13 ounces of gold, 1,926 ounces of silver, 1,992 pounds of copper, 160,531 pounds of lead, and 13,455 pounds of zinc. Other district lode production was largely 73 tons of gold-copper ore from the Coronation group and 70 tons of gold ore from the Ah-Ve-Ha claims. Drift mining at the Crystal gold placer recovered 11 fine ounces of gold.

Trigo District.—Output in 1950 was all placer gold, recovered mostly by dry concentration at the Colorado River Valley property 50 miles north of Yuma.

California
Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By R. B. Maurer

GENERAL SUMMARY

CALIFORNIA 1950 lead production broke a record of 33 years standing in establishing a new high for the metal in the State. Gold output, following the diminishing trend begun in 1948, dropped slightly below 1949 production, whereas silver, reflecting the expanded base-metal output in 1950, rose substantially over 1949. Zinc production exceeded the previous year by a small margin, but copper, largely recovered incidental to other metals in the State, decreased slightly compared to the relatively minor 1949 output. The total value of the five metals in 1950 was $22,081,859 or 7 percent above 1949. It was divided among the metals as follows: Gold, 65 percent; lead, over 19 percent; zinc, 10 percent; silver, nearly 5 percent; and copper, 1 percent. Comparing 1950 with 1949, gold decreased 1 percent in quantity and value; silver increased 37 percent in quantity and value; copper decreased 0.5 percent in quantity but increased 5 percent in value; lead increased 54 percent in quantity and 31 percent in value; and zinc increased 5 percent in quantity and 20 percent in value. Inyo County, leading contributor to metal-mining output in California, produced 32 percent of the State total value of the five metals in 1950 owing to lead and zinc production as well as to noteworthy quantities of gold, silver, and copper. Nevada County ranked second in 1950, principally because of gold ore mined in the Grass Valley-Nevada City district, and contributed 17 percent of the total value of the five metals. Sacramento County, in third place, produced somewhat over 15 percent of the total value of the five metals in 1950, mainly from large-scale gold dredging in the Folsom district. Thus, 64 percent of the State output was centered in 3 of the 58 counties.

Public Law 837, Eighty-first Congress, signed by the President September 25, 1950, opened to mining and other forms of entry approximately 289,500 acres of land in San Bernardino and Riverside Counties within the Joshua Tree National Monument.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. Yardage figures used in measuring material treated in placer operations are "bank measure"; that is, the material is measured in the ground before treatment. The value of metal production has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

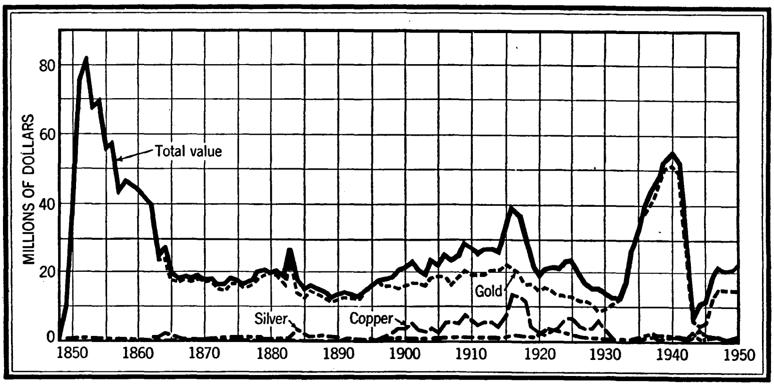

FIGURE 1.—Value of mine production of gold, silver, and copper, and total value of gold, silver, copper, lead, and zinc in California, 1848–1950.

Gold.—Renewed interest in California gold mining late in 1949, following the collapse of base-metal prices, continued in the first quarter of 1950 as rumors of an increase in the fixed price ($35 an ounce) for gold persisted. Spread of hostilities in Korea started an exodus of gold miners to defense jobs; this, coupled with rising operating costs and a realization that the rumors of increased gold price were unfounded, caused many of the newly opened gold mines to suspend operations before the end of 1950. Output of gold in 1950 (including gold in "natural gold" and amalgam sold on the open market), was down compared to 1949 owing to a 1-percent reduction in output of placer mines and an almost 2-percent reduction in that of lode mines. Production was depressed below normal output in November by flood conditions at many placer operations. Block leasing was practiced throughout the year by the State's two leading lode-gold producers, Idaho Maryland Mines Corp. and Empire Star Mines Co., Ltd.

The 20 leading gold-producing mines in California in 1950, listed in table 4, yielded 89 percent of the total gold, the 5 leaders producing 61 percent.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in California, 1946–50, and total, 1848–1950, in terms of recoverable metal [1]

Year	Lode mines [2]		Placer mines [2]		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore, etc., sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	150	627,767	172	84,351,000	356,824	$12,488,840	1,342,651	$1,084,862
1947	210	648,789	210	102,533,000	431,415	15,099,525	1,597,442	1,445,685
1948	241	526,776	195	98,713,900	421,473	14,751,555	724,771	655,954
1949	242	494,906	190	87,577,460	417,231	14,603,085	783,880	709,451
1950	243	547,241	186	86,930,550	412,118	14,424,130	1,071,917	970,139
1848–1950	----------	(3)	--------	(3)	103,563,456	2,326,824,612	112,378,098	90,922,171

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	4,240	$1,373,760	9,923	$2,163,214	6,877	$1,677,988	$18,788,664
1947	2,407	1,010,940	10,080	2,903,040	5,415	1,310,430	21,769,620
1948	481	208,754	9,110	3,261,380	5,325	1,416,450	20,294,093
1949	649	255,706	10,318	3,260,488	7,209	1,787,832	20,616,562
1950	646	268,736	15,831	4,274,370	7,551	2,144,484	22,081,859
1848–1950	630,007	203,038,000	204,991	34,342,295	105,707	22,517,592	2,677,644,670

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, or copper precipitates shipped directly to smelters during the calendar year indicated.

[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

[3] Figure not available.

TABLE 3.—Gold production at placer mines in California, 1946–50, and total, 1848–1950, by class of mine and method of recovery [1]

Class and method	Mines producing [2]	Washing plants (dredges)	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucket-line dredges:						
1946	22	32	78,175,000	244,679	$8,563,765	$0.110
1947	22	35	95,478,000	271,165	9,490,775	.099
1948	22	35	94,747,200	257,171	9,000,985	.095
1949	20	34	83,571,900	226,838	7,939,330	.095
1950	14	26	82,514,000	223,164	7,810,740	.095
Dragline dredges:						
1946	39	38	4,309,000	16,932	592,620	.138
1947	41	35	5,718,000	26,617	931.595	.163
1948	27	27	3,033,000	17,029	596,015	.197
1949	28	24	2,906,600	14,616	511.560	.176
1950	16	14	3,433,300	15,499	542,465	.158
Suction dredges: [3]						
1946	1	1	22,900	112	3,920	.171
1947	7	5	60.000	485	16,975	.283
1948	5	6	83,000	453	15,855	.191
1949	10	11	267,000	1,364	47,740	.179
1950	16	13	263,300	1,407	49,245	.187
Nonfloating washing plants: [4]						
1946	13	13	771,000	2,576	90,160	.117
1947	25	25	261,000	3,916	137.060	.525
1948	15	15	261.700	1,159	40,565	.155
1949	25	26	256,500	3,452	120,820	.471
1950	30	30	123,000	3,293	115,255	.937
Gravel hydraulically handled:						
Hydraulic:						
1946	17	----------	443,300	1,147	40,145	.091
1947	23	----------	332,000	1,194	41,790	.126
1948	28	----------	363,000	1,784	62,440	.172
1949	27	----------	447,900	1,587	55,545	.124
1950	32	----------	383,400	1,468	51,380	.134
Small-scale hand methods: [5]						
Wet:						
1946	72	----------	624,000	4,165	145,775	.234
1947	86	----------	682,000	8,931	312,585	.458
1948	83	----------	211,300	7,704	269,640	1.276
1949	67	----------	125,400	2,576	90,160	.719
1950	58	----------	204,000	3,025	105,875	.519
Dry:						
1946	1	----------	100	3	105	1.050
1947	3	----------	600	6	210	.350
1948	2	----------	600	27	945	1.688
1949	1	----------	660	20	700	1.061
1950	1	----------	50	4	140	2.800
Underground placers:						
Drift:						
1946	7	----------	5,700	158	5,530	.970
1947	3	----------	1,400	224	7,840	5.600
1948	13	----------	14,100	229	8,015	.569
1949	12	----------	1,500	95	3,325	2.217
1950	19	----------	9,500	443	15,505	1.632
Grand total placers:						
1946	172	----------	84,351,000	269,772	9,442,020	.112
1947	210	----------	102,533,000	312,538	10,938,830	.107
1948	195	----------	98,713,900	285,556	9,994,460	.101
1949	190	----------	87,577,460	250,548	8,769,180	.100
1950	186	----------	86,930,550	248,303	8,690,605	.100
1848–1950 [1]	----------	----------		66,629,739	1,467,778,511	(6)

[1] For historical data by years, see Minerals Yearbook, Review of 1940, p. 219.
[2] Excludes itinerant propectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Includes all placer operations using suction pump for delivering gravel to floating washing plants.
[4] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge." Includes byproduct gold recovered at commercial gravel plants.
[5] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[6] Complete data not available.

TABLE 4.—Twenty leading gold-producing mines and 10 leading silver-producing mines in California in 1950, in order of output

Rank	Mine	District	County	Rank in 1949	Operator	Source of metal
			GOLD-PRODUCING MINES			
1	Natomas dredges	Folsom	Sacramento	1	Natomas Co	Dredge.
2	Yuba unit	Yuba River	Yuba	3	Yuba Consolidated Gold Fields	Do.
3	Idaho and Brunswick units	Grass Valley-Nevada City	Nevada	2	Idaho Maryland Mines Corp	Gold ore.
4	Empire Star group	do	do	4	Empire Star Mines Co., Ltd	Do.
5	Old Eureka	Mother Lode	Amador	6	Central Eureka Mining Co	Do.
6	Butte unit	Oroville	Butte	7	Yuba Consolidated Gold Fields	Dredge.
7	Capital dredges	Folsom	Sacramento	5	Capital Dredging Co	Do.
8	Original Sixteen to One	Alleghany	Sierra	9	Original Sixteen to One Mine, Inc	Gold ore.
9	La Grange dredge No. 4	Tuolumne River (La Grange)	Stanislaus	10	La Grange Gold Dredging Co	Dredge.
10	Siskiyou unit	Scott River (Callahan)	Siskiyou	12	Yuba Consolidated Gold Fields	Do.
11	Snelling dredge	Merced River (Snelling)	Merced	8	Snelling Gold Dredging Co	Do.
12	Thurman dredge	Redding	Shasta	11	Thurman Gold Dredging Co	Do.
13	Cosumnes dredge	Cosumnes River	Sacramento	14	Cosumnes Gold Dredging Co	Do.
14	Fairview placers	Trinity River (Lewiston)	Trinity	30	Fairview Placers	Do.
15	Lower Comanche dredge	Camanche	San Joaquin	17	Gold Hill Dredging Co	Do.
16	Dredge No. 3	Hunter Valley (Hornitas)	Mariposa	19	Thurman & Wright	Do.
17	General dredge	Folsom	Sacramento	15	General Dredging Co	Do.
18	Shoshone group	Resting Springs	Inyo	20	Anaconda Copper Mining Co	Lead ore.
19	Indian Creek placer	Scott River (Deadwood)	Siskiyou	16	French Gulch Dredging Co	Dredge.
20	Kister dredge	Oroville	Butte	13	Gold Hill Dredging Co	Do.
			SILVER-PRODUCING MINES			
1	Darwin group	Coso	Inyo	1	Anaconda Copper Mining Co	Zinc-lead and lead ores.
2	Shoshone group	Resting Springs	do	2	do	Lead ore.
3	Afterthought	Cow Creek (Ingot)	Shasta	3	Coronado Copper & Zinc Co	Zinc ore.
4	Empire Star group	Grass Valley-Nevada City	Nevada	6	Empire Star Mines Co., Ltd	Gold ore.
5	Pine Creek	Bishop (Pine Creek)	Inyo	5	United States Vanadium Corp	Tungsten ore.
6	Idaho & Brunswick units	Grass Valley-Nevada City	Nevada	7	Idaho Maryland Mines Corp	Gold ore.
7	Penn	Campo Seco	Calaveras	10	Penn Chemical Co	Zinc ore.
8	Minnietta	Modoc	Inyo	14	Finley & Vignich	Lead and silver ores.
9	Roosevelt-Bagdad Chase	Buckeye	San Bernardino.	12	Donald Love	Gold and copper ores.
10	Whitmore	Mojave	Kern	(1)	Lessees of Whitmore Mines, Inc	Gold-silver ore.

[1] Small output in 1949, not separable, included with a group of mines.

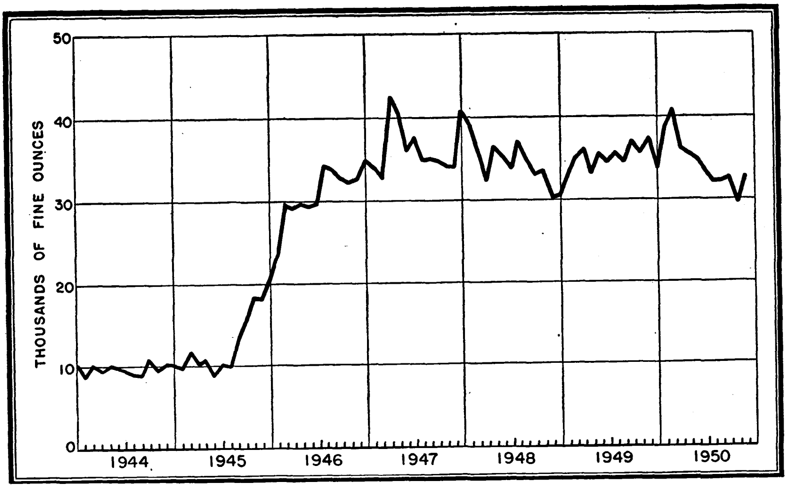

FIGURE 2.—Mine production of gold in California, 1944–50, by months, in terms of recoverable gold.

Silver.—The increase in California's total recoverable silver in 1950 over 1949 was due to expanded exploitation of argentiferous lead and zinc-lead ores, particularly in the Coso and Resting Springs districts of Inyo County. Of the State silver, 92 percent was derived from base-metal ores and 8 percent from precious metal ores and gravels; only a fraction of 1 percent was recovered from straight silver ore. The 10 leading silver-producing mines, listed in table 4, yielded 94 percent of the total silver in 1950, and the 5 leading mines yielded 90 percent.

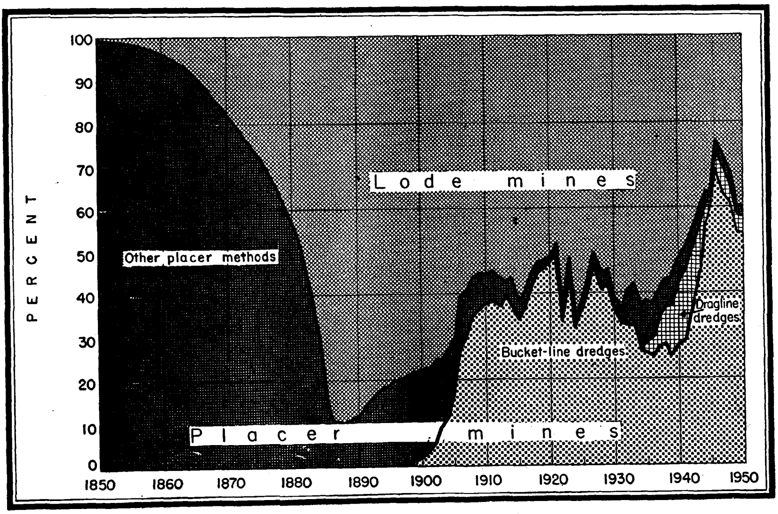

FIGURE 3.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850–1950.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	33,843	88,499	28	1,355	549
February	38,770	86,540	39	1,246	524
March	40,723	92,558	53	1,411	614
April	36,043	76,745	37	1,143	646
May	35,424	75,130	31	1,250	412
June	34,784	99,627	25	1,517	430
July	33,318	89,039	28	1,347	449
August	32,101	96,278	65	1,401	876
September	32,249	96,360	71	1,358	786
October	32,637	96,893	111	1,343	857
November	29,547	86,052	80	1,263	670
December	32,679	88,196	78	1,197	738
Total: 1950	412,118	1,071,917	646	15,831	7,551
1949	417,231	783,880	649	10,318	7,209

Copper.—There was a small increase in copper production from straight copper ore in 1950 compared with 1949, but ores mined primarily for other metals continued to be the principal source of the State copper. The leading producers of recoverable copper were the Coronado Copper & Zinc Co. Afterthought mine, Cow Creek (Ingot) district, Shasta County, and Penn Chemical Co. Penn mine, Campo Seco district, Calaveras County (zinc ore); Anaconda Copper Mining Co. Darwin group, Coso district, Inyo County (zinc-lead and lead ores); and United States Vanadium Corp. Pine Creek mine, Bishop district, Inyo County (tungsten ore).

Lead.—The record-breaking production of lead in California in 1950 was achieved largely because Anaconda Copper Mining Co. developed the Darwin group of mines, Coso district,[1] and the Shoshone group, Resting Springs district, Inyo County, to the extent that enough lead and zinc-lead ores were available to insure continuous operation at both properties throughout the year.

Other producers of lead included the Coronado Copper & Zinc Co. Afterthought mine; Louis Warnken, Jr., Gold Bottom mine dump, Slate Range district, San Bernardino County; George Lippincott, Lead King (Lippincott) mine, Ubehebe district, and Finley & Vignich, Minnietta mine, Modoc district, Inyo County. Of the 42 California mines with yields of recoverable lead, only 2 were in the category of 500 tons or more lead produced in 1950; 1 mine produced in the range of 100 to 200 tons of lead; and 5 mines were in the range of 20 to 50 tons. Each of the remainder produced less than 20 tons of lead during the year.

Zinc.—Anaconda Copper Mining Co. Darwin group of mines dominated the State output of zinc in 1950 and was followed in second place by Coronado Copper & Zinc Co. Afterthought mine, Shasta County, which resumed operation in August 1950 after more than 1 year of inactivity. In addition, Anaconda Copper Mining Co. Shoshone group; Penn Chemical Co. Penn mine, Campo Seco district, Calaveras County; and J. Q. Little, Carbonate King zinc mine, Ivanpah district, San Bernardino County—the latter a shipper of oxidized zinc ore to a slag-fuming plant—contributed to the State

[1] Mining World, vol. 12, No. 12, November 1950, pp. 8-11.

total of recoverable zinc. Of the 10 California mines with outputs of recoverable zinc, 3 were in the category of 500 tons or more zinc produced in 1950 and 1 mine produced in the range of 200 to 500 tons of zinc. The remainder had outputs below 50 tons of zinc for the year.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties, in terms of recoverable metal

County	Mines producing [1]		Gold					
			Lode		Placer		Total	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador	9	4	19,516	$683,060	498	$17,430	20,014	$700,490
Butte	1	5	20	700	19,434	680,190	19,454	680,890
Calaveras	10	8	2,086	73,010	625	21,875	2,711	94,885
Del Norte	1	------	22	770	------	------	22	770
El Dorado	12	9	1,293	45,255	2,567	89,845	3,860	135,100
Fresno	1	3	2	70	156	5,460	158	5,530
Humboldt	1	1	8	280	88	3,080	96	3,360
Imperial	5	------	1,759	61,565	------	------	1,759	61,565
Inyo	32	------	6,483	226,905	------	------	6,483	226,905
Kern	29	2	5,894	206,290	303	10,605	6,197	216,895
Lassen	1	------	2	70	------	------	2	70
Los Angeles	4	2	79	2,765	215	7,525	294	10,290
Madera	1	11	92	3,220	1,076	37,660	1,168	40,880
Mariposa	19	8	963	33,705	5,782	202,370	6,745	236,075
Merced	------	3	------	------	7,261	254,135	7,261	254,135
Modoc	3	------	24	840	------	------	24	840
Mono	5	------	606	21,210	------	------	606	21,210
Monterey	1	------	21	735	------	------	21	735
Nevada	7	21	[2] 103,232	[2] 3,613,120	2,650	92,750	105,882	3,705,870
Placer	3	13	313	10,955	714	24,990	1,027	35,945
Plumas	4	3	35	1,225	311	10,885	346	12,110
Riverside	8	------	59	2,065	------	------	59	2,065
Sacramento	1	11	49	1,715	98,103	3,433,605	98,152	3,435,320
San Bernardino	30	2	2,251	78,785	509	17,815	2,760	96,600
San Diego	4	------	55	1,925	------	------	55	1,925
San Joaquin and Stanislaus [3]	------	5	------	------	14,312	500,920	14,312	500,920
Shasta	9	3	476	16,660	7,299	255,465	7,775	272,125
Sierra	12	17	17,262	604,170	355	12,425	17,617	616,595
Siskiyou	10	26	315	11,025	13,493	472,255	13,808	483,280
Trinity	3	15	50	1,750	7,481	261,835	7,531	263,585
Tulare	2	(4)	5	175	8	280	13	455
Tuolumne	14	4	843	29,505	37	1,295	880	30,800
Yuba	1	10	(2)	(2)	65,026	2,275,910	65,026	2,275,910
Total: 1950	243	186	163,815	5,733,525	248,303	8,690,605	412,118	14,424,130
1949	242	190	166,683	5,833,905	250,548	8,769,180	417,231	14,603,085

For footnotes, see end of table.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties, in terms of recoverable metal—Continued

County	Silver					
	Lode		Placer		Total	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador	4,180	$3,783	69	$62	4,249	$3,845
Butte	3	3	1,377	1,246	1,380	1,249
Calaveras	12,421	11,242	82	74	12,503	11,316
Del Norte	11	10	-----	-----	11	10
El Dorado	439	397	349	316	788	713
Fresno	-----	-----	24	22	24	22
Humboldt	1	1	12	11	13	12
Imperial	429	388	-----	-----	429	388
Inyo	933,048	844,456	-----	-----	933,048	844,456
Kern	9,453	8,555	77	70	9,530	8,625
Lassen	1	1	-----	-----	1	1
Los Angeles	70	63	28	25	98	88
Madera	18	16	299	271	317	287
Mariposa	469	424	1,521	1,377	1,990	1,801
Merced	-----	-----	724	655	724	655
Modoc	11	10	-----	-----	11	10
Mono	2,990	2,706	-----	-----	2,990	2,706
Monterey	4	4	-----	-----	4	4
Nevada	[2] 30,963	[2] 28,023	318	288	31,281	28,311
Placer	416	377	67	60	483	437
Plumas	87	79	35	31	122	110
Riverside	865	783	-----	-----	865	783
Sacramento	9	8	4,481	4,056	4,490	4,064
San Bernardino	13,001	11,767	102	92	13,103	11,859
San Diego	12	11	-----	-----	12	11
San Joaquin and Stanislaus [3]	-----	-----	1,418	1,283	1,418	1,283
Shasta	40,956	37,067	861	779	41,817	37,846
Sierra	3,398	3,075	54	49	3,452	3,124
Siskiyou	87	79	1,715	1,552	1,802	1,631
Trinity	12	11	664	601	676	612
Tulare	-----	-----	1	1	1	1
Tuolumne	253	229	4	4	257	233
Yuba	([2])	([2])	4,028	3,646	4,028	3,646
Total: 1950	1,053,607	953,568	18,310	16,571	1,071,917	970,139
1949	766,083	693,344	17,797	16,107	783,880	709,451

For footnotes, see end of table.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties, in terms of recoverable metal—Continued

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Amador							$704,335
Butte							682,139
Calaveras	196,700	$40,914	37,900	$5,117	651,000	$92,442	244,674
Del Norte			500	68			848
El Dorado							135,813
Fresno							5,552
Humboldt							3,372
Imperial	100	21					61,974
Inyo	437,200	90,937	31,133,900	4,203,076	11,561,700	1,641,761	7,007,135
Kern							225,520
Lassen							71
Los Angeles							10,378
Madera							41,167
Mariposa			2,700	365			238,241
Merced							254,790
Modoc							850
Mono							23,916
Monterey							739
Nevada							3,734,181
Placer							36,382
Plumas	8,200	1,706	100	14			13,940
Riverside	1,300	270	45,900	6,196			9,314
Sacramento							3,439,384
San Bernardino	219,300	45,614	64,900	8,761	116,900	16,600	179,434
San Diego							1,936
San Joaquin and Stanislaus [3]							502,203
Shasta	428,200	89,066	375,500	50,692	2,772,400	393,681	843,410
Sierra							619,719
Siskiyou			400	54			484,965
Trinity							264,197
Tulare							456
Tuolumne	1,000	208	200	27			31,268
Yuba							[4] 2,279,556
Total: 1950	1,292,000	268,736	31,662,000	4,274,370	15,102,000	2,144,484	22,081,859
1949	1,298,000	255,706	20,636,000	3,260,488	14,418,000	1,787,832	20,616,562

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Yuba County lode gold and lode silver included with Nevada County.
[3] Combined to avoid disclosure of individual output.
[4] From property not classed as a mine.

MINING INDUSTRY

The 11-percent increase in total tonnage of ores and old tailings treated in 1950 compared to 1949 reflected the substantial increases in all base-metal ores except zinc ore and lead-copper ore. Silver ore treated (largely for the added value of its lead content) increased over 1949, whereas output of gold ore and gold-silver ore declined in 1950. Despite the increased activity at mines and claims owing to the lifting of the moratorium on annual assessment work, actually 429 mines reported production in 1950 compared to 432 in 1949. Lode mines produced 40 percent of the State gold and placer mines 60 percent in 1950.

The average recoverable gold oontent of gravel treated in 1950 remained the same as 1949, whereas the yardage handled at placer mines decreased 1 percent compared with 1949. Bucket-line dredges washed 95 percent of the total gravel mined in the State and recovered 90 percent of the total placer gold, and drag-line dredges washed 4 percent of the total gravel handled and recovered 6 percent of the placer gold; fewer dredges of each type were operated in 1950 than in

1949. Thirteen suction dredges washed gravel in 1950 compared to 11 in 1949, and more nonfloating washing plants (used in conjunction with mechanical excavators) were operated in 1950 largely at mines formerly exploited by hydraulic and hand methods. Hydraulic mines, drift mines, and hand-operated placers were a source of only 2 percent of the total placer gold.

ORE CLASSIFICATION

California ores sold or treated in 1950 are classified in table 7. Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines [1]	Material sold or treated		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
		Ore (short tons)	Old tailings (short tons)					
Dry gold ore	193	372,218	9,133	155,811	49,458	34,200	38,400	----------
Dry gold-silver ore	4	767	1,732	363	9,735	9,400	100,700	----------
Dry silver ore	8	1,060	-------	7	7,935	500	45,100	----------
Total	204	374,045	10,865	156,181	67,128	44,100	184,200	----------
Copper ore [2]	10	2,473	17	1,218	26,831	440,100	----------	
Lead ore	22	54,298	---------	5,485	462,472	90,200	19,420,500	1,730,300
Lead-copper ore	1	3	---------	3	26	300	700	----------
Zinc ore	3	18,473	---------	563	49,959	553,600	411,200	3,521,700
Zinc-lead ore	5	87,067	---------	365	447,191	163,700	11,645,400	9,850,000
Total lode mines	243	536,359	10,882	163,815	1,053,607	1,292,000	31,662,000	15,102,000
Gravel (placer operations)	186	---------	---------	248,303	18,310	----------	----------	----------
Total: 1950 [2]	429	536,359	10,882	412,118	1,071,917	1,292,000	31,662,000	15,102,000
1949 [3]	432	491,957	2,949	417,231	783,880	1,298,000	20,636,000	14,418,000

[1] Detail will not add to totals because some mines produce more than one class of ore.
[2] Content of copper ore includes gold and silver recovered from tungsten ore; silver and copper from pyritic ore (residue); copper from precipitates, and gold, silver, and copper from furnace cleanup, not included with material treated.
[3] Includes gold, silver and copper from tungsten ore; silver and copper from pyritic ore (residue); copper from precipitates and copper from furnace matte, not included with material treated.

METALLURGICAL INDUSTRY

In 1950, of the 547,241 tons of lode material (including 10,882 tons of old tailings) from California mines sold or treated during 1950, 94 percent went to mills and 6 percent to smelters. Companies producing most of the State lode gold and mines that concentrated the bulk of California base-metal ores operated their own metallurgical plants. Included with the few mills that received custom ore were: Burton Bros., Inc., Rosamond, treatment by cyanidation of material from Kern, Inyo, San Bernardino, and Los Angeles Counties; the Mojave Mining & Milling Co. (Martin Beck), Mojave, concentration of precious metal ore and lead ore from Kern, Inyo, and San Bernardino Counties; and Butte Lode Mining Co., Randsburg, amalgamation and cyanidation of Kern and San Bernardino County ore. The Empire Star Mines Co., Ltd., Grass Valley, Nevada County, cyanided lots of

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	248,303	18,310			
Amalgamation	107,786	18,670			
Cyanidation	45,057	31,666			
Smelting of ore and old tailings	5,581	380,172	321,300	14,982,300	1,435,400
Smelting of concentrate	5,391	623,099	925,200	16,679,700	13,666,600
Smelting of precipitates (copper)			45,500		
Total: 1950	412,118	1,071,917	1,292,000	31,662,000	15,102,000
1949	417,231	783,880	1,298,000	20,636,000	14,418,000

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore and old tailings treated at mills

	Material treated		Recoverable in bullion		Concentrates shipped to smelters and recoverable metal [1]					
	Ore [2] (short tons)	Old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES										
Amador	40,624	8,350	19,386	4,146	13	96	22			
Butte	37		20	3						
Calaveras	11,766		1,261	352	1,278	774	11,980	196,500	37,900	651,000
El Dorado	6,586		1,293	439						
Fresno	150	20			10	2				
Humboldt	10		8	1						
Imperial	5,728		1,725	416						
Inyo and Shasta [3]	126,534	100	375	666	28,209	3,087	607,799	726,700	16,607,300	13,015,600
Kern	11,942	535	5,692	7,835	21	202	1,618			
Lassen		3	2	1						
Los Angeles	22		45	12	5	34	58			
Madera	100		84	16	1	8	2			
Mariposa	2,561	23	801	167	34	138	173		2,700	
Modoc	10		3	1						
Mono	3,668		604	1,469						
Nevada	[4]238,245		[4,5]103,051	[4]30,872	12	181	91			
Placer	427		313	416						
Plumas	60	1	26	3						
Riverside	524		2	1	33	43	411	600	28,800	
Sacramento	1		49	9						
San Bernardino	1,830		297	120	20	162	589	400	2,400	
San Diego	45		11	2	1	1				
Sierra	19,107	21	16,750	3,237	62	495	156			
Siskiyou	34,052		304	75	2	11	12		400	
Trinity	93		31	7	2	19	5			
Tulare	1	40	5							
Tuolumne	678	40	705	70	37	138	183	1,000	200	
Total: 1950	504,801	9,133	[5]152,843	50,336	29,740	5,391	623,099	925,200	16,679,700	13,666,600
1949	462,941	2,939	154,358	63,148	23,289	7,437	413,509	975,300	10,099,600	12,738,600
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS										
Dry gold					293	2,056	1,830	1,500	6,100	
Dry gold-silver					10	136	1,505			
Dry silver					1		14		200	
Copper					767	114	23,998	318,900	20,200	
Lead					15,375	2,704	516,874	129,200	15,666,600	1,208,100
Zinc					11,151	[3]347	[3]74,858	[3]423,600	[3]971,700	[3]11,807,500
Zinc-lead-copper					1,341					
Zinc-copper					802	34	4,020	52,000	14,900	651,000
Total: 1950					29,740	5,391	623,099	925,200	16,679,700	13,666,600

For footnotes, see end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by method of recovery (except placer) and class of material processed in terms of recoverable metal—Continued

B. For ore and old tailings shipped directly to smelters

	Material treated		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
	Ore (short tons)	Old tailings (short tons)					
BY COUNTIES							
Amador	20		34	12			
Calaveras	27		51	89	200		
Del Norte	53		22	11		500	
Imperial	20		34	13	100		
Inyo	27,140	1,732	3,419	362,056	67,600	14,900,100	1,318,500
Mariposa	35		24	129			
Modoc	6		21	10			
Mono	3		2	1,521			
Monterey	2		21	4			
Plumas	1	17	9	84	8,200	100	
Riverside	72		14	453	700	17,100	
San Bernardino	4,098		1,792	12,292	218,900	62,500	116,900
San Diego	20		43	10			
Shasta [6]	59		78	3,483	71,100	2,000	
Sierra	2		17	5			
Total: 1950 [6]	31,558	1,749	5,581	380,172	366,800	14,982,300	1,435,400
1949 [7]	29,016	10	4,888	289,426	322,700	10,536,400	1,679,400
BY CLASS OF MATERIAL							
Dry gold	1,365		1,000	1,475	32,200	600	
Dry gold-silver	71	1,732	152	4,582	9,400	100,700	
Dry silver	93		2	3,846	400		
Copper [6]	2,473	17	1,184	10,019	265,600		
Lead	27,217		3,236	358,611	58,800	14,820,500	1,307,000
Lead-copper	3		3	26	300	700	
Zinc	151			1,194		2,200	98,300
Zinc-lead	185		4	419	100	57,600	30,100
Total: 1950	31,558	1,749	5,581	380,172	366,800	14,982,300	1,435,400

[1] Includes concentrates and gold, silver, and copper from tungsten ore not included with material treated.
[2] Figures under "ore" include both raw ore and concentrates produced from that ore, amalgamanted or cyanided.
[3] Combined to avoid disclosure of individual output.
[4] Includes ore milled and contained recoverable metal from Yuba County.
[5] Includes gold recovered and sold as "natural gold."
[6] Content of copper ore from Shasta County includes gold, silver, and copper from furnace cleanup, copper from precipitates, and silver and copper from pyritic ore (residue) not included with material treated.
[7] Includes gold, silver, and copper from furnace matte, copper from precipitates, and silver and copper from pyritic ore (residue) not included with material treated.

concentrates and milled small tonnages of ore from mines in Sierra, Amador, Nevada, El Dorado, and Placer Counties on a custom basis. The lead plant of the American Smelting & Refining Co. at Selby, Contra Costa County—the State's only smelter treating principally nonferrous primary materials—resumed operations March 6, 1950, following settlement of a labor dispute that closed the plant December 1, 1949. The Lippincott Lead Co. at Santa Ana, Orange County, reduced argentiferous lead ore in its blast furnace operated in conjunction with a storage-battery plant.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	293	2,058	1,832	2,255	6,682	
Dry gold-silver	10	136	1,505			
Dry silver	1		14	58	233	
Copper	767	114	23,998	325,414	33,584	107,812
Lead	15,375	2,704	516,874	152,377	15,946,497	1,679,290
Zinc	11,151	[1] 347	[1] 74,858	[1] 483,467	[1] 1,011,146	[1] 12,239,355
Zinc-lead-copper	1,341					
Zinc-copper	802	52	6,185	64,958	24,849	731,509
Total: 1950	29,740	5,411	625,266	1,028,529	17,022,991	14,757,966
1949	23,289	7,457	417,023	1,091,328	10,336,797	13,597,359
ORE AND OLD TAILINGS SHIPPED DIRECTLY TO SMELTERS						
Dry gold ore	1,365	1,000	1,477	33,039	683	
Dry gold-silver ore and old tailings	1,803	152	4,582	12,581	103,322	
Dry silver ore	93	2	3,923	449		
Copper ore [2] and old tailings	2,490	1,185	10,050	274,193		
Lead ore	27,217	3,236	358,717	68,456	15,088,829	1,858,356
Lead-copper ore	3	3	26	305	719	
Zinc ore	151		1,865		2,233	122,022
Zinc-lead ore	185	4	419	258	58,623	41,477
Total: 1950 [2]	33,307	5,582	381,059	389,281	15,254,409	2,021,855
1949 [2]	29,026	4,894	302,680	363,019	10,765,787	2,272,170

[1] Combined to avoid disclosure of individual output.
[2] Content of copper ore includes gold, silver, and copper from furnace cleanup; copper from precipitates; and silver and copper from pyritic ore (residue), not included with material treated.

REVIEW BY COUNTIES AND DISTRICTS

AMADOR COUNTY

East Belt District.—Garibaldi Bros. worked the Garibaldi mine from February 15 to August 26, 1950, and recovered 89 ounces of gold and 13 ounces of silver from 12,000 cubic yards of gravel handled by dragline and trommel.

Mother Lode District.—Central Eureka Mining Co. operated the Old Eureka mine throughout 1950 and treated 39,993 tons of ore; 16,146 ounces of gold and 3,373 ounces of silver were recovered by amalgamation of ore and 2,992 ounces of gold and 702 ounces of silver by cyanidation of concentrates.

BUTTE COUNTY

Oroville District.—Yuba Consolidated Gold Fields operated three Yuba-type electric bucket-line dredges throughout 1950 on claims adjoining the Feather River. Gold Hill Dredging Co. worked its Kister electric bucket-line dredge from January 1 to June 30, 1950, 7 miles south of Oroville on the east side of the Feather River.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing [1]		Ore and old tailing (short tons)	Gold (fine ounces)			Silver (lode and placer,[2] fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Amador County:											
Camanche [3]		2			46	46	4				$1,613
Cosumnes River		(4)			12	12	2				422
East Belt [5]	4	1	251	80	202	282	67				9,930
Ione		(4)			109	109	21				3,834
Mother Lode [6]	5	1	48,743	19,436	129	19,565	4,155				688,536
Butte County:											
Butte Creek		(4)			18	18	2				632
Cherokee	1	(4)	37	16	11	27	2				947
Dry Creek		1			9	9	1				316
Honcut		(4)			8	8	1				281
Magalia		(4)			24	24	5				844
Oroville		(7)			(7)	(7)	(7)				(7)
Paradise		(4)			11	11	2				387
Sterling (Inskip)		1			8	8					280
Yankee Hill	(4)	1	clean-up	4	9	13	1				456
Calaveras County:											
Camanche [3]		1			20	20	1				701
Campo Seco	1	2	7,611	255	6	261	11,312	196,500	35,500	651.000	157,480
East Belt [5]	5	(4)	2,925	1,414	88	1,502	863	200	2,400		53,717
Jenny Lind	3	1	1,256	415	17	432	269				15,364
Mother Lode [6]	1	4	1	2	494	496	58				17,412
Del Norte County: Monumental	1		53	22		22	11		500		848
El Dorado County:											
Cosumnes River		(4)			1	1					35
East Belt [5]	(7)	(4)	(7)	(7)	1	[8] 1					[8] 35
Folsom [9]		1			30	30	3				1,053
Mother Lode [6]	9	6	5,675	1,026	2,531	3,557	575				125,015
Pilot Hill		(4)			1	1					35
West Belt [10]	1	2	1	21	3	24	2				842
Fresno County:											
Friant [11]		3			156	156	24				5,482
Trimmer	(7)		(7)	(7)		(7)					(7)
Humboldt County: Orleans	1	1	10	8	88	96	13				3,372
Imperial County:											
Cargo Muchacho	4		5,747	1,759		1,759	428				61.952
Paymaster	1		1				1	100			22
Inyo County:											
Bishop (Pine Creek)	(7)		tungsten ore	(7)		(7)	(7)	(7)			(7)
Cerro Gordo	(7)		(7)	(7)		(7)	(7)	(7)	(7)		(7)
Chloride Cliff	4		144	101		101	81		3,000		4,013

Confidence	1		11	17		17	3				598
Coso	3		98,863	532		532	600,440	180,500	16,957,100	10,473,800	4,376,081
Fish Springs	2		146	39		39	37				1,398
Independence (Russ)	2		149	190		190	1,949	1,100	15,000		10,668
Kearsarge (Waucoba)	1		36	1		1	123		2,200		443
Modoc	3		1,208	20		20	11,951	1,100	173,600		35,181
Resting Springs	(7)		(7)	(7)		(7)	(7)	(7)	(7)	(7)	(7)
Sherman	1		400	13		13	3				458
Slate Range [12]	2		1,775	127		127	3,575	9,400	116,700	6,100	26,256
South Park	3		93	18		18	181	100	13,200	10,400	4,073
Ubehebe	(7)		(7)				(7)		(7)		(7)
White Mountains [13]	2		236	1		1	2,608		11,800		3,988
Wild Rose	3		108	121		121	82		900		4,430
Kern County:											
Agua Caliente	1		5	1		1	1				36
Bakersfield		(7)			(7)	(7)	(7)				(7)
Greenhorn Mountains	1		5	7		7	3				248
Keyes	1	(4)	2	2	7	9	3				318
Mojave	11		10,211	5,248		5,248	9,269				192,069
Rademacher	1		6	1		1	5				39
Randsburg [14]	12		2,247	627		627	171				22,099
Sageland	2		1	8		8	3				283
Lassen County: Diamond Mountain	1		3	2		2	1				71
Los Angeles County:											
Cedar	3		22	45		45	12				1,586
Neenach	1		clean-up	34		34	58				1,242
San Gabriel		2			215	215	28				7,550
Madera County:											
Chowchilla River (Raymond)		5			627	627	184				22,112
Fresno River (Dennis)		5			294	294	84				10,366
Friant [11]		(7)			(7)	(7)	(7)				(7)
Potter Ridge	1		100	92		92	18				3,236
Mariposa County:											
East Belt [5]	5	3	1,436	483	32	515	270		2,700		18,634
Hunter Valley (Hornitos)	1	(7)	12	5	(7)	[15] 5	[15] 111				[15] 275
Mother Lode [6]	12	3	1,166	474	71	545	109				19,174
West Belt [10]	1	1	5	1	125	126	24				4,432
Merced County:											
Le Grand		1			20	20	3				703
Merced River (Snelling)		(7)			(7)	(7)	(7)				(7)
Modoc County: Hi Grade	3		16	24		24	11				850
Mono County:											
Masonic	1		3,605	596		596	573				21,378
Mount Patterson	1		54	4		4	2,414				2,325
White Mountains [13]	3		12	6		6	3				213
Monterey County: Los Burros	1		2	21		21	4				739
Nevada County:											
French Corral	1	8	15	17	434	451	50				15,830
Graniteville		1			15	15	1				526
Grass Valley-Nevada City	(7)	1	(7)	(7)	97	[8] 97	[8] 18				[8] 3,411
Washington (North Bloomfield)	3	9	5,403	1,550	[16] 2,022	3,572	443				125,421
You Bet		2			82	82	5				2,875

For footnotes, see end of table.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties and districts, in terms of recoverable metal—Continued

County and district	Mines producing [1]		Ore and old tailing (short tons)	Gold (fine ounces)			Silver (lode and placer,[2] fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Placer County:											
Auburn (Penryn)	2	1	392	291	28	319	416				$11,542
Blue Canyon		(4)			11	11	1				386
Colfax		(4)			74	74	8				2,597
Dutch Flat	(4)	(4)	clean-up	18	38	56	4				1,964
Folsom [8]		(7)			(7)	(7)	(7)				(7)
Foresthill	1	2	35	4	79	83	8				2,912
Iowa Hill		3			130	130	11				4,560
Last Chance		2			81	81	6				2,840
Michigan Bluff		2			10	10					350
Ralston Divide		1			34	34	3				1,193
Plumas County:											
Butte Valley		(4)			6	6	1				211
Edmanton		1			6	6	1				211
Genesee	1		17	8		8	77	8,200			2,056
Greenville	1	(4)	46	18	5	23	2				807
Johnsonville		1			4	4					140
La Porte		1			232	232	22				8,140
Quincy		(4)			37	37	5				1,299
Rich	1	(4)	1	1	21	22	13		100		795
Sawpit Flat	1		15	8		8	1				281
Riverside County:											
Bendigo	1		8	8		8	6	300			347
Chuckawalla	1		1	1		1	2				37
Dale [17]	1		500	39		39	373	600	27,300		5,513
Eagle Mountains	1		23	7		7	64	300	2,200		662
Ironwood	2		60	2		2	419	100	16,400		2,684
Pinacate (Perris)	2		4	2		2	1				71
Sacramento County:											
Cosumnes River		(7)			(7)	(7)	(7)				(7)
Folsom [9]	1	9	1	49	90,952	91,001	4,119				3,188,763
San Bernardino County:											
Barstow (Grapevine)	1		1	1		1					35
Belleville (Ord Mountain)	(7)	(4)	(7)	(7)	24	[8] 24	[8] 2		(7)		[8] 842
Black Hawk	1		9	9		9	3				318
Buckeye	1		2,966	1,652		1,652	5,405	152,300			94,390
Calico	1		435	85		85	14				2,988
Cima	1		16				14		200		40
Clark Mountains	3		232	1		1	578	1,000	47,100	13,600	9,056
Dale [17]	2		738	202		202	232	400	400		7,417
Hikorum	1		1	1		1	1				36
Holcomb		1			4	4					140

Ivanpah (Bullion)	2		717	92		92	4,570	62,500	2,200	98,300	34,612
Kingston	(7)		(7)	(7)		(7)	(7)		(7)	(7)	(7)
Providence	2		101				359		2,000		595
Randsburg [14]	1	1	496	142	481	623	139				21,930
Shadow Mountain	1		5				155		2,000		410
Signal	1		1	4		4	4				144
Silurian	1		6				723				654
Silver Mountain	1		5	1		1	1				36
Slate Range [12]	1		43				686				621
Solo	1		3	3		3	1				106
Spangler	2		22	6		6	44				250
Whipple Mountains (Monumental)	3		64	45		45	9	3,100			2,228
San Diego County:											
El Cajon	1		5	4		4	1				141
Julian (Banner)	2		40	8		8	1				281
Pine Valley	1		20	43		43	10				1,514
San Joaquin County: Camanche [3]		(7)			(7)	(7)	(7)				(7)
Shasta County:											
Battle Creek		(4)			32	32	6				1,125
Bully Hill	(4)		furnace clean-up	58		58	856	18,200			6,590
Cottonwood Creek		(4)			12	12	2				422
Cow Creek (Ingot)	(7)		(7)	(7)		(7)	(7)	(7)	(7)	(7)	(7)
Dog Creek		(4)			6	6					210
Flat Creek	(7)		pyrites & precip.				(7)	(7)			(7)
French Gulch	2	(4)	120	9	2	11	1				386
Harrison Gulch		(4)			2	2					70
Igo	1	(4)	59	20	4	24	1,091		2,000		2,097
Redding	2	(7)	119	53	(7)	[15] 53	[15] 14				[15] 1,868
Shasta	2	(4)	18	28	78	106	21				3,729
Sierra County:											
Alleghany	7	3	12,720	14,194	120	14,314	2,537				503,286
Downieville	(7)	5	(7)	(7)	137	[8] 137	[8] 13				[8] 4,806
Gibsonville		(4)			1	1					35
Gold Lake	1	1	1	2	1	3	1				106
Indian Hill		1			26	26	3				913
Pike	1		1,100	135		135	65				4,783
Poker Flat	1	3	6	10	39	49	6				1,721
Port Wine		(7)			(7)	(7)	(7)				(7)
Sierra City		2			3	3					105
Siskiyou County:											
Klamath River [18]	6	7	251	89	1,092	1,181	177		400		41,550
Salmon River [19]	2	11	1,200	20	[16] 299	319	44				11,204
Scott River [20]	2	6	32,601	206	12,083	12,289	1,580				431,545
Soda Creek		(4)			5	5					175
Yreka		(7)			(7)	(7)	(7)				(7)
Stanislaus County:											
Stanislaus River [21]		1			13	13	2				457
Tuolumne River [22]		(7)			(7)	(7)	(7)				(7)

For footnotes, see end of table.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in California in 1950, by counties and districts, in terms of recoverable metal—Continued

County and district	Mines producing [1]		Ore and old tailing (short tons)	Gold (fine ounces)			Silver (lode and placer,[2] fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Trinity County:											
Deadwood	2		81	36		36	8				$1,267
Hayfork	1	(7)	12	14	(7)	[15] 14	[15] 4				[15] 494
New River		1			7	7	1				246
Trinity River		13			7,469	7,469	662				262,014
Tulare County:											
Hot Springs	1		40	4		4					140
Lemon Cove	1	(4)	1	1	8	9	1				316
Tuolumne County:											
East Belt (5)	7		234	530		530	52				18,597
Mother Lode (6)	7	4	484	313	37	350	205	1,000	200		12,671
Yuba County:											
Bear River		(4)			6	6					210
Browns Valley	1	(4)	(7)	(7)	5	[8] 5	1				[8] 176
Camptonville		4			202	202	30				7,097
Challenge		(4)			2	2					70
Dobbins		3			62	62	8				2,177
Honcut Creek		(4)			34	34	4				1,194
Smartville		1			49	49	4				1,719
Strawberry		1			42	42	5				1,475
Yuba River		1			64,624	64,624	3,976				2,265,438
Undistributed [23]	18	24	291,357	[16] 110,452	61,471	171,923	389,287	655,000	14,224,900	3,848,800	8,972,759
Total California [24]	243	186	547,241	163,815	248,303	412,118	1,071,917	1,292,000	31,662,000	15,102,000	22,081,859

1 Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
2 Source of total silver as follows: 1,053,607 ounces from lode mines and 18,310 ounces from placer mines.
3 Camanche district lies in Amador, Calaveras, and San Joaquin Counties.
4 From property not classed as a mine.
5 East Belt district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.
6 Mother Lode district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.
7 Included with "Undistributed."
8 Exclusive of lode output which is included with "Undistributed."
9 Folsom district lies in El Dorado and Sacramento Counties.
10 West Belt district lies in El Dorado and Mariposa Counties.
11 Friant district lies in Fresno and Madera Counties.
12 Slate Range district lies in Inyo and San Bernardino Counties.
13 White Mountains district lies in Inyo and Mono Counties.
14 Randsburg district lies in Kern and San Bernardino Counties.
15 Exclusive of placer output which is included with "Undistributed."
16 Includes gold recovered and sold as "natural gold."
17 Dale district lies in Riverside and San Bernardino Counties.
18 Klamath River district includes Humbug.
19 Salmon River district includes Liberty.
20 Scott River district includes Callahan, Deadwood, and Scott Bar.
21 Stanislaus River district includes Knights Ferry and Oakdale.
22 Tuolumne River district includes La Grange and Waterford.
23 Includes values and quantities which cannot be shown separately for certain individual districts as indicated in the appropriate column by footnote reference 7.
24 Includes gold and silver recovered from tungsten ore; silver and copper from pyritic ore (residue); copper from precipitates; and gold, silver, and copper from furnace clean-up; tonnage not included with ore and old tailings.

CALAVERAS COUNTY

Campo Seco District.—Penn Chemical Co. operated the Penn mine from July 1 through December 31, 1950; 7,611 tons of zinc ore milled yielded 389 tons of concentrate containing in gross metal 80 ounces of gold, 7,186 ounces of silver, 147,382 pounds of copper, 33,584 pounds of lead, and 107,812 pounds of zinc; 802 tons of concentrate containing 52 ounces of gold, 6,185 ounces of silver, 64,958 pounds of copper, 24,849 pounds of lead, and 731,509 pounds of zinc; and 6 tons of concentrate containing 141 ounces of gold, 106 ounces of silver, 190 pounds of copper, and 483 pounds of lead. The concentrates were shipped to lead, copper, and zinc smelters.

East Belt District.—Blackstone Mine worked the Blackstone mine throughout 1950 and milled 2,500 tons of ore; gold and silver were recovered by amalgamation, and flotation concentrate shipped to a smelter yielded gold, silver, and some lead.

DEL NORTE COUNTY

Monumental District.—Raymond Mitchell and E. C. Matthews worked the Monumental Consolidated mine for a short period in 1950 and shipped ore containing gold, silver, copper, and lead to a smelter.

EL DORADO COUNTY

East Belt District.—Hazel Creek Mine worked the Hazel Creek mine 6 miles southeast from Pollock Pines in 1950 and shipped ore containing gold and silver to a custom-cyanide plant for treatment.

Mother Lode District.—River Pine Mining Co., Ltd., operated a dragline with a 2-cubic yard bucket and a floating washing plant, both Diesel-powered, on the North Fork of the Cosumnes River throughout 1950. Lode-gold mines worked during the year included the Alhambra, Clysdale, El Dorado, Argonaut, Grit, Shaw, and Clayton.

West Belt District.—Wentworth, Mann & Smith developed the Sugar Loaf mine for 3 months in 1950 and recovered 21 ounces of gold and 2 ounces of silver by amalgamating the ore.

FRESNO COUNTY

Friant District.—Pacific Coast Aggregates, Inc., and the Anderson Rock Plant recovered gold and silver incident to operation of their commercial rock and gravel plants. L. A. Purinton operated a suction dredge for 45 days in 1950.

HUMBOLDT COUNTY

Orleans District.—Luthena White and Fred Ray hydraulicked the Pearch mine during 1950, recovering gold and some silver.

IMPERIAL COUNTY

Cargo Muchacho District.—Holmestake Mining Co., Inc., worked the Cargo Muchacho mine from July 1 to December 31, 1950, and recovered 1,718 ounces of gold and 415 ounces of silver from 5,686 tons of ore by cyanidation at the company rebuilt mill.

INYO COUNTY

Bishop (Pine Creek) District.—The United States Vanadium Corp. operated the Pine Creek mine throughout 1950 and produced by flotation a copper concentrate containing a substantial quantity of silver and some gold as a byproduct from ore treated primarily for tungsten.

Cerro Gordo District.—Santa Rosa Mining Co. worked the Santa Rosa mine in 1950 and shipped ore containing values in gold, silver, copper, and lead to a smelter.

Coso District.—Anaconda Copper Mining Co. operated the Darwin group of mines throughout 1950. The lead concentrate and zinc concentrate produced from the zinc-lead sulfide ore and treated at the company 300-ton flotation mill were shipped to smelters. In addition lead ore containing gold, silver, copper, and zinc was shipped for direct smelting.

Modoc District.—Ross Finley & Tom Vignich operated the Minnietta mine throughout 1950; 800 tons of ore milled at the company 40-ton gravity plant yielded 53 tons of concentrate containing in gross metal 3 ounces of gold, 2,827 ounces of silver, 162 pounds of copper, 44,247 pounds of lead, and 9,472 pounds of zinc. In addition, 140 tons of direct smelting ore (containing 10 ounces of gold, 4,221 ounces of silver, 755 pounds of copper, 33,071 pounds of lead, and 39,218 pounds of zinc) were shipped. Foreman & Skinner operated the Defense mine and A. L. Foss worked the Surprise mine in 1950; values in gold, silver, copper, and lead were recovered from the ores shipped to a smelter.

Resting Springs District.—Anaconda Copper Mining Co. operated the Shoshone group of mines throughout 1950. Sulfide flotation of the lead ore followed by flotation of oxidized lead minerals, using a sulfidizer, yielded a lead concentrate containing gold, silver, copper, and zinc. The concentrate and lead ore (containing substantial quantities of gold and silver and some copper and zinc) were shipped to smelters.

Slate Range District.—Louis Warnken, Jr., shipped 1,732 tons of tailing containing values in gold, silver, copper, and lead from the Gold Bottom mine dump. Ned E. Raymond shipped 43 tons of dump ore containing values in silver, lead, and zinc from the Ophir mine.

South Park District.—Harry A. Briggs shipped 40 tons of ore containing in gross metal 4 ounces of gold, 179 ounces of silver, 159 pounds of copper, 13,379 pounds of lead, and 14,335 pounds of zinc to a smelter in 1950 from the Red Cloud mine.

Ubehebe District.—Lippincott Lead Mines worked the Lead King (Lippincott) mine in 1950 and consigned argentiferous lead ore to the Lippincott reduction works at Santa Ana, Calif.

White Mountains District.—Morris Albertoli operated the Hope group of claims from October 1 to November 15, 1950, and shipped (to a smelter) 47 tons of ore containing in gross metal 1 ounce of gold, 405 ounces of silver, 95 pounds of copper, 9,313 pounds of lead, and 7,000 pounds of zinc.

KERN COUNTY

Mojave District.—Burton Bros., Inc., operated its cyanide mill throughout 1950 on ore from the Tropico and Cactus Queen mines and in addition treated ores from other mines in the Mojave district, including the Amethiste, Elephant-Eagle, and Standard. Mojave Mining & Milling Co. (Martin Beck) concentrated gold and silver ores from mines in the Mojave district, including the Whitmore, Blue Bird, Bob Tail, Liberty, Pride of Mojave, Yellow Dog, and Red Wing. Concentrates were shipped to a smelter.

Randsburg District.—Butte Lode Mining Co. operated the Butte Lode mine throughout 1950 and recovered gold and silver by amalgamating 327 tons of ore and cyaniding 500 tons of tailings. In addition, 1,315 tons of custom ore from other Randsburg district mines, including the Pioneer (in San Bernardino County), Big Dyke, Hard Cash (California), Nancy Hanks, Josephine, and Florence, were amalgamated. King Soloman Lease, E. B. Atkinson, partner, operated the Yellow Aster mine in 1950 and recovered gold and silver by amalgamation at the lessee's mill.

LOS ANGELES COUNTY

San Gabriel District.—San Gabriel Valley Placers recovered 86 ounces of gold and 12 ounces of silver as by-products of the Azusa Rock & Sand Co. aggregate plant operation.

MADERA COUNTY

Chowchilla River District.—Suction dredges were operated by the Chowchilla Dredge Co., L. R. Casteel, Howell Bros., Verne Snyder, and Merlyn Taylor in 1950.

Fresno River (Dennis) District.—Sherwood Green operated a 10-inch suction dredge at Hensley Bridge from January to September 1950; 73 ounces of gold and 24 ounces of silver were recovered from 25,000 cubic yards of gravel washed. Robert Brock, Elmer Holiday, Ernest Noble, and Ernest Smith also operated suction dredges in 1950.

MARIPOSA COUNTY

East Belt District.—Glenn-Steintorf Co. milled ore from the Marble Springs mine in 1950 and recovered gold and silver by amalgamation; concentrate shipped to a smelter contained gold, silver, and some copper and lead. Other mines that operated during the year included Mexican Diggings (R. H. Jackson), Schroeder group (Schroeder Mines), and Williams Bros. mine.

Hunter Valley (Hornitos) District.—Thurman & Wright dredged on Burns Creek from January 19 to September 25 and from November 25 to December 31, 1950, using a dragline with 5-cubic yard bucket and a Bodinson floating washing plant, both electrically powered.

Mother Lode District.—Gold ore from a number of mines worked during 1950 (including the A. J. claim, Combination and Blue Bird claims, Diltz Oro Grande, Lucky Boy, Nutmeg, and Specimen) was treated by amalgamation.

MERCED COUNTY

Merced River (Snelling) District.—Snelling Gold Dredgeing Co. operated a Yuba electric bucket-line dredge with 66 7-cubic foot buckets adjacent to the Merced River between Snelling and Merced Falls throughout 1950.

MONO COUNTY

Masonic District.—Sarita Milling Co. cyanided 3,575 tons of ore from the Sarita and Pittsburg mines from May 15 to September 10, 1950, recovering gold and silver.

NEVADA COUNTY

French Corral District.—R. L. Forkner operated the French Bar mine from September 1 to December 15, 1950, using a mechanical excavator in conjunction with a vibrating screen and sluice boxes; 220 ounces of gold and 21 ounces of silver were recovered from 5,000 cubic yards of gravel washed.

Grass Valley-Nevada City District.—Idaho Maryland Mines Corp. operated the Idaho and Brunswick units throughout 1950, treating gold ore by amalgamation followed by cyanidation of concentrates at the company 900-ton concentrating mill and 30-ton cyanide plant. A mine fire on September 4, 1950, caused only minor operational delays. The Empire Star Mines Co., Ltd., treated ore from the Empire Star group of mines in Nevada County and the Browns Valley group in Yuba County by amalgamation and cyanidation throughout 1950; ore and concentrates from several neighboring properties also were treated on a custom basis at the Grass Valley 500-ton mill and cyanide plant.

Washington (North Bloomfield) District.—Ancho Erie Mining Co. operated the Ancho & Erie group throughout 1950, recovering gold and silver by amalgamation and cyanidation at the company 200-ton concentration mill and 6-ton cyanide plant. Several placer mines were operated in 1950, including the Biglow (Cliff Frazier), Eastman (Crescent Pacific Mining Co.), Howie group (Howie Mining Co.), Omega (Goldfield Consolidated Mines Co.), Relief Hill (Western Gold, Inc., and lessees, and Waukashau (Mellott & Mellott).

PLACER COUNTY

Auburn (Penryn) District.—The Mary Len mine, formerly worked by Mary Len Mine (a partnership), was operated by A. H. L. Mining Co. for 6 months in 1950; 294 tons of gold ore were treated by amalgamation; flotation concentrates were shipped to a custom-cyanide plant.

PLUMAS COUNTY

Greenville District.—E. R. Lewis operated the L & L mine from April 1 to November 1, 1950, and amalgamated 45 tons of ore and 1 ton of old tailings.

La Porte District.—A. T. Merian worked tailings at the Jumbo mine by sluicing and at the Lucky Bend mine by dragline dredging in 1950. Gold and silver were recovered. The dragline dredge subsequently was operated in the Strawberry district, Yuba County.

RIVERSIDE COUNTY

Dale District.—Lyman Webster, Leslie Spell, and Arthur Becker operated the Oro Mega mine from January 1 to May 5, 1950; 500 tons of ore milled at the Ivanhoe plant yielded 31 tons of lead concentrate containing gold, silver, and some copper.

Ironwood District.—Dan Figueroa & Sons worked the Bald Eagle mine from November 5 to December 15, 1950, and shipped 56 tons of lead ore containing some gold, silver, and copper to a smelter.

SACRAMENTO COUNTY

Cosumnes River District.—Cosumnes Gold Dredging Co. operated a bucket-line dredge near Sloughhouse in 1950. Mountain Gold Dredging Co. worked the Van Vleck property by dragline dredging from January 1 to October 20, 1950.

Folsom District.—The Natomas Co. operated six bucket-line dredges (one 9 months, one 11 months) and four units 12 months in 1950 near the American River. According to the company annual report for 1950, normal production was maintained while operating costs were lower due mainly to a decrease in repair requirements for the year. Capital Dredging Co. worked two bucket-line dredges 5 miles south of Folsom throughout 1950. Fair Oaks Gravel Co. recovered as byproducts 147 ounces of gold and 11 ounces of silver from 50,424 cubic yards of material washed at its commercial gravel plant on the American River. General Dredging Co. operated a dragline dredge near Natoma the entire year.

SAN BERNARDINO COUNTY

Buckeye District.—Donald F. Love shipped gold ore and copper ore from the Roosevelt-Bagdad Chase mine to a smelter in 1950; substantial quantities of gold, silver, and copper were recovered.

Clark Mountain District.—Carbonate King Mines developed the Carbonate King group in 1950; 52 tons of ore containing in gross metal 18 ounces of silver, 15,271 pounds of lead, and 9,121 pounds of zinc were shipped to a smelter. Edward Koppelman shipped zinc-lead ore to a smelter from the Kally mine, and Mohawk Mines, Inc., shipped lead ore to a smelter from the Mohawk mine in 1950.

Ivanpah (Bullion) District.—Alloy Mining Co. operated the New Trail group throughout 1950 and shipped 566 tons of ore containing in gross metal 92 ounces of gold, 3,376 ounces of silver, and 63,800 pounds of copper to a smelter. J. Q. Little shipped 151 tons of zinc carbonate ore containing some silver and lead to a slag fuming plant in 1950.

Randsburg District.—Rhoades, Kirkland, Ralston & Ralston shipped 496 tons of gold ore to a custom mill from the Pioneer group from January 1 to November 15, 1950; gold and silver were recovered by amalgamation. Surcease Mining Co. operated a dry-land dredge at the Super Mold mine from January 1 to April 18, 1950; 13,107 cubic yards of gravel yielded 481 ounces of gold and 100 ounces of silver.

Whipple Mountains (Monumental) District.—Gold Trail Mine operated the Gold Trail group for a short time in 1950 and shipped 58 tons of ore (including ore mined in 1949), containing in gross metal

38 ounces of gold, 6 ounces of silver, and 2,629 pounds of copper to a smelter.

SAN JOAQUIN COUNTY

Comanche District.—The Gold Hill Dredging Co. worked its Lower Comanche bucket-line dredge throughout 1950 along the Mokelumne River.

SHASTA COUNTY

Cow Creek (Ingot) District.—Coronado Copper & Zinc Co. operated the Afterthought mine from August through December 1950. Zinc concentrate and zinc-lead-copper concentrate produced from the zinc ore milled at the company 100-ton plant were shipped to smelters.

Redding District.—Thurman Gold Dredging Co. operated its Yuba electric bucket-line dredge on Clear Creek throughout 1950. Roy S. Olson worked the Battams property by dragline dredging in 1950, and A. J. Jackson operated a small dragline dredge near Buckeye from January 2 to April 2, 1950.

SIERRA COUNTY

Alleghany District.—John O'Donnell worked the Kate Hardy mine throughout 1950; 2 tons of high-grade ore yielded 983 ounces of gold and 216 ounces of silver. Milling ore was stockpiled. The Original Sixteen to One Mine, Inc., operated its Original Sixteen to One Mine throughout 1950 and recovered gold and some silver by amalgamation and from concentrate shipped to a smelter.

Downieville District.—Best Mines Co. acquired the Brush Creek Mine lease in March 1950 and operated the Brush Creek mine through December. Gold and silver were recovered by amalgamation at the 100-ton Best mill and from concentrates cyanided at a custom mill.

SISKIYOU COUNTY

Klamath River District.—Reeves Ranch Dredging Co. worked its bucket-line dredge 1 mile from Happy Camp from January 1 to October 1, 1950. K. C. Columbia Mines, Inc., milled 200 tons of ore from the K. C. Columbia mine dump on McKinney Creek and recovered gold and silver by amalgamation; 2 tons of concentrate shipped to a smelter contained in gross metal 11 ounces of gold, 12 ounces of silver, 446 pounds of lead, and 48 pounds of zinc.

Salmon River District.—Hydraulic mines operated in 1950 included the Boulder Gulch group (Northwestern Mining Co.), Emma group (N. S. Dysert), Farnsworth (E. A. McBroom), Good Luck (Ted Finn), Joubert (Louis J. Joubert and lessees), Judge (Judge Hydraulic Mine), Rainbow group (W. M. Durch), and Whites Gulch (Alex Markon & Arthur Johnson).

Scott River District.—French Gulch Dredging Co. terminated operation of its bucket-line dredge at Indian Creek placer November 8, 1950. Yuba Consolidated Gold Fields operated a bucket-line dredge near Callahan throughout 1950. Emmor W. Little worked the Star mine on McAdams Creek by drag-line dredging throughout 1950. The Mill Creek Co. operated the Quartz Hill mine from May 7 to December 31, 1950. Ore amalgamated yielded gold and silver; concentrates produced were not treated.

STANISLAUS COUNTY

Tuolumne River (La Grange) District.—La Grange Gold Dredging Co. operated dredge No. 4 equipped with 62 10-cubic-foot buckets on the Tuolumne River bottom throughout 1950.

TRINITY COUNTY

Deadwood District.—Brown Bear Mines worked the Brown Bear mine from March to August 1950; 80 tons of ore were treated at the company 80-ton flotation plant and 2 tons of concentrate shipped to a smelter yielded gold and some silver.

Hayfork District.—T. C. Kelly operated the Kelly mine sporadically in 1950 and treated gold ore by amalgamation. M. M. Fariss and Jo Dowdell hydraulicked the Home Extension group from February to April 1950.

Trinity River District.—Goldfield Consolidated Mines Co. and Warren Gilzean, lessee, hydraulicked the Barthol-Jacobs (Red Hill) property from January 1 through May 31, 1950. Bennett Mining Co. hydraulicked the Bennett mine near Big Bar for 118 days in 1950. Other hydraulic mines worked included the Gold Dollar, Hickey, Rex, and Swanson. Fairview Placers operated a bucket-line dredge near Minersville throughout 1950.

TUOLUMNE COUNTY

East Belt District.—Stobaugh & Ray worked the Fidelity mine throughout 1950 and recovered 434 ounces of gold and 26 ounces of silver from 15 tons of ore amalgamated. In addition, 793 pounds of gold concentrate were shipped to a smelter. Other gold mines operated in the district included the Golden Star (George and John Miller), Hopeful (Gust Nystrom), Lucky Strike (Mel Coeur), and Tip-Top (A. C. Weaver).

Mother Lode District.—Terminal clean-up of the Eagle Shawmut mill was made by W. R. Leedom in 1950. Ralph W. and Jo Tapley recovered a substantial quantity of gold and some silver from the Ford pocket mine in 1950 by hand mortar and batch mill.

YUBA COUNTY

Browns Valley District.—Empire Star Mines Co. and lessees operated the Browns Valley group through the Dannebroge shaft during 1950 in conjunction with the company's Nevada County properties.

Yuba River District.—Yuba Consolidated Gold Fields operated its fleet of five bucket-line dredges in the Yuba River Basin throughout 1950.

Colorado

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By A. J. Martin

GENERAL SUMMARY

ALTHOUGH fewer mines producing gold, silver, copper, lead, and zinc operated in Colorado in 1950 than in 1949, the average output per mine, measured in value of recovered metals, was the highest since the counting of mines on a comparable basis was begun in 1904. With 232 mines producing in 1950, the total value of the output of the five metals was $29,323,268, compared with 282 mines and $27,474,322 in 1949 and a yearly average of 688 mines and $25,070,753 from 1904 to 1948. The count of mines includes all lode mines, placers, prospects, and dumps that produced one or more of the five metals. Zinc represented 44 percent of the total value in 1950, lead 25 percent, gold 16 percent, silver 11 percent, and copper 4 percent. Changes from 1949 in quantity of output were a decrease of 4 percent in zinc and increases of 1 percent in lead, 21 percent in silver, 27 percent in gold, and 31 percent in copper.

Except for two placer operations, continuous mining centered in the districts producing chiefly base metals or gold and silver along with base metals. The Upper San Miguel, Red Cliff (Battle Mountain), and Leadville districts had large increases in production and together contributed 79 percent of the total zinc, 77 percent of the copper, 60 percent of the lead, 58 percent of the gold, and 48 percent of the silver. The heaviest decline was in the Ten Mile (Kokomo) district, where the Victory-Lucky Strike-Wilson-McKinley group of mines, one of the State's leading producers, closed April 19. Output from the famous Cripple Creek gold district was the smallest since mining was begun there in 1891. Several other important gold districts had little or no output.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Colorado, 1946–50, and total, 1858–1950, in terms of recoverable metal [1]

Year	Mines producing		Ore sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1946	235	28	1,463,496	142,613	$4,991,455	2,240,151	$1,810,042
1947	290	33	1,544,694	168,279	5,889,765	2,557,653	2,314,676
1948	271	23	1,438,119	154,802	5,418,070	3,011,011	2,725,117
1949	255	27	1,262,355	102,618	3,591,630	2,894,886	2,620,018
1950	202	30	1,372,744	130,390	4,563,650	3,492,278	3,160,688
1858–1950			(2)	39,614,032	880,368,084	742,382,506	578,390,624

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	1,754	$568,296	17,036	$3,713,848	36,147	$8,819,868	$19,903,509
1947	2,150	903,000	18,696	5,384,448	38,745	9,376,290	23,868,179
1948	2,298	997,332	25,143	9,001,194	45,164	12,013,624	30,155,337
1949	2,403	946,782	26,853	8,485,548	47,703	11,830,344	27,474,322
1950	3,141	1,306,656	27,007	7,291,890	45,776	13,000,384	29,323,268
1858–1950	260,703	70,439,139	2,559,581	269,074,943	1,516,586	249,481,030	2,047,753,820

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore shipped to smelters during calendar year indicated.
[2] Figure not available.

TABLE 3.—Gold and silver produced at placer mines in Colorado, 1946–50, in fine ounces, in terms of recoverable metal

Year	Small-scale hand methods [1]		Gravel mechanically handled: Nonfloating washing plants [2]		Gravel mechanically handled: Bucket-line and dragline dredges		Total	
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1946	89	15	1,047	169	19,036	3,514	20,172	3,698
1947	243	52	930	156	16,400	3,243	17,573	3,451
1948	106	29	662	103	12,479	2,680	13,247	2,812
1949	137	33	775	116	12,231	2,652	13,143	2,801
1950	83	21	1,246	196	18,084	3,522	19,413	3,739

[1] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."

Gold.—Of the 130,390 fine ounces of gold produced in Colorado in 1950, San Miguel County contributed 41 percent, Lake 16 percent, Park 13 percent, San Juan 11 percent, Eagle and Teller, each 4 percent, and other counties 11 percent. Cripple Creek, ordinarily the State's largest gold-producing district, had little output in 1950, as there was no market for the mill-grade ore. The new Carlton custom mill, built to replace the old Golden Cycle mill as a market for the ore, was nearly completed in 1950. Dry gold and silver ores yielded 43 percent of the State total gold, zinc-lead and zinc-lead-copper ores 39 percent, placers 15 percent, and other ores 3 percent. The leading gold-producing properties, in order of rank, were Smuggler Union-Montana group (Telluride Mines) at Telluride, Treasury Tunnel-Black Bear (Idarado) in San Miguel County, Resurrection at Leadville, South Platte Dredging Co. dredge near Fairplay, and Shenandoah-Dives group near Silverton.

Silver.—Production of silver in Colorado totaled 3,492,278 fine ounces in 1950 compared with 2,894,886 ounces in 1949. Dry gold and silver ores yielded 45 percent of the State total silver, zinc-lead and zinc-lead-copper ores 43 percent, lead ore 7 percent, and other ores and placer gravel 5 percent. The leading producers of silver were the Eagle mine in Eagle County, Treasury Tunnel-Black Bear (Idarado) group in San Miguel County, Shenandoah-Dives group near Silverton, Emperius Mining Co. group at Creede, and Smuggler Union-Montana group at Telluride.

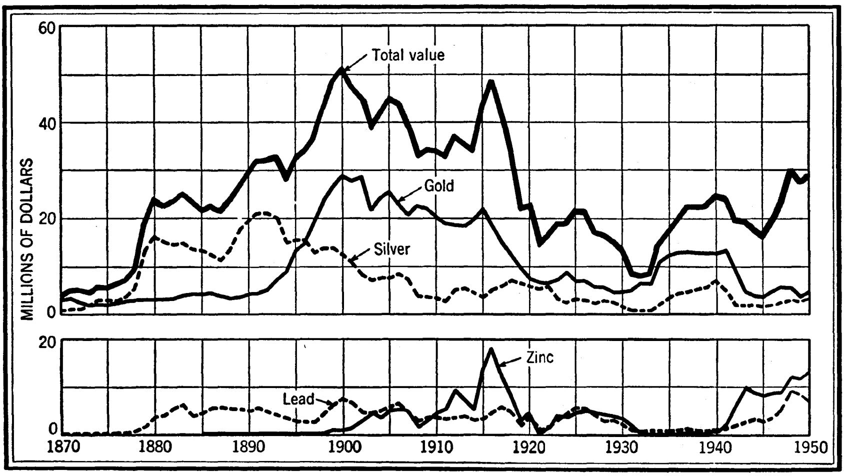

FIGURE 1.—Value of mine production of gold, silver, lead, and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1870–1950. The value of copper has been less than $2,000,000 annually, except in a few years.

Copper.—The State output of copper increased from 2,403 tons in 1949 to 3,141 tons in 1950. The Idarado Mining Co., which makes a copper concentrate from complex gold-silver-copper-lead-zinc ore mined in San Miguel County, was the principal copper producer. The Eagle mine in Eagle County shipped copper-silver-gold ore; and several mines, mostly in the San Juan region, shipped lead or bulk concentrates containing considerable copper.

Lead.—The price of lead dropped from 12 cents to 10.5 cents a pound between January 1 and March 14, 1950, and did not rise above 12 cents until August 15. Further advances raised the price to 17 cents October 31, but the average yearly price (13.5 cents) was the lowest since 1946. The Colorado output of recoverable lead amounted to 27,007 tons in 1950 compared with 26,853 in 1949. San Miguel County contributed 29 percent of the State total lead, Lake County 24 percent, San Juan 13, Eagle 8, Summit 6, Mineral 5, and other counties 15 percent. Zinc, zinc-lead, and zinc-lead-copper ores yielded 70 percent of the total lead, gold and silver ores 20 percent, and lead, lead-copper, and copper ores 10 percent. The larger lead-producing mines, in order of rank, were the Resurrection, Treasury Tunnel-Black Bear (Idarado), Smuggler Union-Montana, Eagle, and Emperius Mining Co. group.

Zinc.—After increasing 4 years in succession, the production of recoverable zinc in Colorado showed a small decrease in 1950; the output was 45,776 tons compared with 47,703 tons in 1949. Eagle County produced 44 percent of the State total zinc, San Miguel County 19 percent, Lake 16, Summit 8, and other counties 13 percent. Zinc, zinc-lead, and zinc-lead-copper ores yielded 93 percent of the total zinc. The leading zinc-producing mines, in order of rank, were the Eagle, Treasury Tunnel-Black Bear (Idarado), Resurrection, Victory (American Smelting & Refining Co. Kokomo unit), and Smuggler Union-Montana.

In Summit County depletion of ore reserves in the Victory-Lucky Strike-Wilson-McKinley group of mines at Kokomo caused this large

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Adams		3	909	$31,815	137	$124
Boulder	10	1	1,653	57,855	76,526	69,260
Chaffee	7		217	7,595	2,801	2,535
Clear Creek	30		3,298	115,430	84,245	76,246
Custer	3		1	35	348	315
Dolores	5		71	2,485	72,735	65,829
Eagle	3		5,636	197,260	669,461	605,896
Fremont	1		1	35	21	19
Gilpin	7	12	84	2,940	315	285
Gunnison	11		95	3,325	73,281	66,323
Hinsdale	6		23	805	1,717	1,554
Jefferson		5	137	4,795	21	19
Lake	18	2	21,008	735,280	280,633	253,987
La Plata	2		61	2,135	1,443	1,306
Larimer	1		11	385	19	17
Mineral	2		803	28,105	345,247	312,466
Montezuma	1		215	7,525	1,180	1,068
Ouray	18		5,000	175,000	238,021	215,421
Park	6	3	16,321	571,235	11,363	10,284
Pitkin	4		14	490	30,869	27,938
Saguache	6		689	24,115	30,342	27,461
San Juan	25		13,902	486,570	596,149	539,545
San Miguel	9	1	53,618	1,876,630	820,132	742,261
Summit	23	3	844	29,540	153,334	138,775
Teller	4		5,779	202,265	1,938	1,754
Total: 1950	202	30	130,390	4,563,650	3,492,278	3,160,688
1949	255	27	102,618	3,591,630	2,894,886	2,620,018

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by counties, in terms of recoverable metal—Continued

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Adams							$31,939
Boulder	14	$5,824	155	$41,850	3	$852	175,641
Chaffee	1	416	79	21,330	2	568	32,444
Clear Creek	13	5,408	314	84,780	152	43,168	325,032
Custer			5	1,350			1,700
Dolores	35	14,560	1,138	307,260	1,365	387,660	777,794
Eagle	326	135,616	2,110	569,700	19,956	5,667,504	7,175,976
Fremont					4	1,136	1,190
Gilpin			3	810			4,035
Gunnison	20	8,320	697	188,190	995	282,580	548,738
Hinsdale	1	416	23	6,210	5	1,420	10,405
Jefferson							4,814
Lake	152	63,232	6,392	1,725,840	7,392	2,099,328	4,877,667
La Plata							3,441
Larimer							402
Mineral	34	14,144	1,422	383,940	873	247,932	986,587
Montezuma	1	416					9,009
Ouray	190	79,040	1,100	297,000	909	258,156	1,024,617
Park	14	5,824	58	15,660	255	72,420	675,423
Pitkin			67	18,090	21	5,964	52,482
Saguache	24	9,984	404	109,080	232	65,888	236,528
San Juan	345	143,520	3,392	915,840	1,295	367,780	2,453,255
San Miguel	1,953	812,448	7,937	2,142,990	8,881	2,522,204	8,096,533
Summit	18	7,488	1,711	461,970	3,436	975,824	1,613,597
Teller							204,019
Total: 1950	3,141	1,306,656	27,007	7,291,890	45,776	13,000,384	29,323,268
1949	2,403	946,782	26,853	8,485,548	47,703	11,830,344	27,474,322

producer to close April 19. The subsequent decrease in Summit County's production was partly offset by expanded output in Eagle, San Miguel, and Lake Counties and the reopening in July of the Rico Argentine mine in Dolores County, closed since May 1949.

Advances in the price of zinc between March 14 and September 7, 1950, raised the quotation for prime Western zinc at East St. Louis from 9.75 to 17.5 cents a pound, as high a quotation as has been registered in any recent year.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	7,258	235,788	233	1,921	3,484
February	8,321	231,238	222	2,136	4,003
March	10,139	258,814	234	1,963	3,892
April	10,897	312,340	305	2,237	3,650
May	13,730	352,846	285	2,007	3,728
June	10,902	322,370	285	2,027	3,167
July	9,118	254,629	223	2,120	3,028
August	12,463	336,642	322	2,355	3,821
September	12,091	329,404	295	2,501	4,190
October	12,136	297,565	270	2,651	4,231
November	11,758	290,359	234	2,528	4,321
December	11,577	270,283	233	2,561	4,261
Total: 1950	130,390	3,492,278	3,141	27,007	45,776
1949	102,618	2,894,886	2,403	26,853	47,703

MINING INDUSTRY

Lode mining centered in the districts producing chiefly zinc, zinc-lead, and silver-lead ores or complex gold-silver-lead and gold-silver-copper-lead-zinc ores. The mining of straight gold ore was confined to a few scattered small-scale operations. The quantity of each class of ore mined in 1950 is shown in table 6.

Under the classification system used, a large part of the complex ore falls into the dry-gold and gold-silver classes, although the revenue obtained from gold and silver must be supplemented by that derived from the accompanying base metals to make the mining of the ore profitable. On the other hand, much of the ore that falls into the base-metal classes is commercial because it contains gold and silver in addition to base metals.

The rise in the prices of lead and zinc was a factor in the reopening of the Rico Argentine mine and revived some smaller mining operations, but the total number of lode mines contributing to the State output of gold, silver, copper, lead, and zinc declined from 255 in 1949 to 202 in 1950. Of the 30 producing placers in 1950, only 2, the bucket-line dredge in Park County and the Mount Elbert dragline-dredge operation in Lake County, were important producers.

The mining companies carried on much exploration and development work, mostly in the vicinity of their producing or equipped properties. The Bureau of Mines resumed work on driving the Leadville drainage tunnel, did exploratory drilling in the Ross Basin (San Juan County) area, and made field examinations and metallurgical tests on ores.

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines[1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	42	229,019	37.039	239,886	243,052	5,980,682	4,540,700
Dry gold-silver ore	21	312,202	19,129	1,137,863	1,238,495	4,258,795	1,486,177
Dry silver ore	22	19,071	305	197,321	19,121	715,968	61,901
Total	84	560,292	56,473	1,575,070	1,500,668	10,955,445	6,088,778
Copper ore	5	639	27	13,081	67,994	27,686	652
Lead ore	66	49,164	2,115	243,609	109,237	5,129,593	580,593
Lead-copper ore	1	1	7	109	131	108	----------
Zinc ore	9	210,661	1,826	150,666	71,658	4,100,307	40,505,609
Zinc-lead ore[2]	70	551,987	50,529	1,506,004	4,532,312	33,800,861	44,376,368
Total	130	812,452	54,504	1,913,469	4,781,332	43,058,555	85,463,222
Total lode mines	202	1,372,744	110,977	3,488,539	6,282,000	54,014,000	91,552,000
Gravel (placer operations)	30	----------	19,413	3,739	----------	----------	----------
Total: 1950	232	1,372,744	130,390	3,492,278	6,282,000	54,014,000	91,552,000
1949	282	1,262,355	102,618	2,894,886	4,806,000	53,706,000	95,406,000

[1] Detail will not add to totals because some mines produce more than 1 class of ore.
[2] Includes zinc-lead-copper ore, for which the Bureau of Mines is not at liberty to publish separate figures.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	19,413	3,739			
Amalgamation	29,577	13,648			
Smelting of ore	9,564	760,928	715,432	2,598,432	95,643
Smelting of concentrates	71,836	2,713,963	5,566,568	51,415,568	91,456,357
Total: 1950	130,390	3,492,278	6,282,000	54,014,000	91,552,000
1949	102,618	2,894,886	4,806,000	53,706,000	95,406,000

METALLURGICAL INDUSTRY

The new 1,000-ton custom gold-ore reduction mill of the Golden Cycle Corp. in the Cripple Creek district was nearly completed in 1950. In other districts improvements resulting in increased capacity were made in several flotation mills treating zinc-lead and complex gold-silver-copper-lead-zinc ores. A total of 32 mills operated in the State all or part of 1950. The daily capacity of the mills ranged from 15 to 1,000 tons and averaged 210 tons. All the mills except two small gravity-concentration mills used flotation. Some of the flotation mills, using jigs in the ball-mill-classifier circuit and amalgamators to treat the hutch product of the jigs, recovered considerable gold for direct shipment to the mint. Ore treated in mills totaled 1,330,705 tons and that shipped crude to smelters 42,039 tons in 1950 compared with 1,238,651 and 23,704 tons, respectively, in 1949.

The principal market for Colorado lead, lead-copper, and siliceous gold-silver concentrates and direct-smelting ores continued to be the Arkansas Valley smelter at Leadville. Local markets for mill-grade lead and zinc ores were provided by the Resurrection mill at Leadville, the Shenandoah-Dives mill at Silverton, the American Zinc, Lead & Smelting Co. mill at Ouray, and the American Smelting & Refining Co. Leadville milling unit (closed April 19). The Front Range mill near Idaho Springs purchased gold-silver ore, and several small mills that did not buy ore accepted custom ore for milling at a fixed charge per ton. Custom mills and smelters in the Salt Lake Valley, Utah, afforded additional markets for Colorado zinc-lead ores and concentrates. Copper concentrates and ore were shipped to the El Paso, Tex., and Garfield, Utah, smelters. Zinc concentrates were shipped to smelters at Amarillo and Corpus Christi, Tex.; Depue, Ill; Palmerton, Pa.; and Anaconda and Great Falls, Mont.

Tables 8 and 9 show details of Colorado ores milled and smelted in 1950.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore treated at mills

	Ore treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Boulder	9,495	70	14	[1] 1,023	808	69,651	27,500	294,148	6,000
Chaffee	37	1	2	12	2	194	----------	5,897	4,000
Clear Creek	33,953	1,044	373	1,713	2,196	81,148	25,598	617,758	304,000
Dolores	14,117	12	3	4,195	52	70,888	68,000	2,114,450	2,730,000
Eagle	208,746	--------	--------	48,212	556	140,337	42,602	4,039,041	39,912,000
Fremont	33	--------	--------	9	1	21	----------	----------	8,000
Gilpin	95	6	1	25	15	160	----------	4,200	----------
Gunnison	12,775	44	34	3,151	42	69,382	39,800	1,326,300	1,990,000
Hinsdale	134	--------	--------	35	4	735	1,328	24,435	10,000
Lake	141,682	5,823	2,945	28,379	11,423	227,186	299,304	11,704,604	14,784,000
Mineral	45,181	1	1	4,198	780	278,665	64,813	2,748,667	1,746,000
Ouray	49,002	22	6	4,179	4,956	198,857	342,877	2,085,496	1,818,000
Park	1,649	342	81	684	921	7,302	27,300	59,548	510,000
Pitkin	3,066	--------	--------	213	--------	26,130	----------	121,583	42,000
Saguache	21,330	542	451	1,162	122	17,679	6,254	572,160	464,000
San Juan	277,726	--------	--------	11,199	13,804	591,649	681,408	6,681,995	2,494,357
San Miguel	464,382	20,339	9,444	39,796	33,262	810,675	3,905,600	15,873,968	17,762,000
Summit	45,355	112	143	10,948	666	122,826	34,184	3,141,318	6,872,000
Teller	1,947	1,219	150	70	2,226	478	----------	----------	----------
Total: 1950	1,330,705	29,577	13,648	159,203	71,836	2,713,963	5,566,568	51,415,568	91,456,357
1949	1,238,651	33,208	12,272	179,013	51,332	2,603,913	4,420,309	51,472,588	95,359,810
BY CLASS OF ORE TREATED									
Dry gold	227,681	13,651	7,016	12,957	19,944	223,344	240,552	5,964,572	4,540,700
Dry gold-silver	296,497	--------	--------	7,922	14,046	607,257	629,057	4,074,196	1,486,177
Dry silver	11,630	--------	--------	411	170	90,361	9,950	209,126	61,901
Copper	40	--------	--------	8	--------	110	3,734	739	652
Lead	32,540	17	12	4,629	1,318	146,313	86,932	3,345,952	580,593
Zinc	210,661	343	81	48,982	1,483	150,585	71,658	4,100,307	40,505,609
Zinc-lead [2]	551,656	15,566	6,539	84,294	34,875	1,495,993	4,524,685	33,720,676	44,280,725
Total 1950	1,330,705	29,577	13,648	159,203	71,836	2,713,963	5,566,568	51,415,568	91,456,357
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS									
Dry gold				296	3,181	5,030	3,646	7,964	----------
Dry gold-silver				88	187	2,998	435	7,666	----------
Copper				6,276	13,990	197,449	3,010,334	311,839	143,652
Lead				50,732	45,708	2,268,837	1,820,252	48,711,504	2,567
Lead-copper				167	54	9,317	32,162	140,958	----------
Dry iron [3]				751	4,306	33,435	6,150	607,328	198
Total to copper and lead plants				58,310	67,426	2,517,066	4,872,979	49,787,259	146,417
Zinc concentrates to zinc plants				100,893	4,410	196,897	693,589	1,628,309	91,309,940
Total 1950				159,203	71,836	2,713,963	5,566,568	51,415,568	91,456,357

[1] Includes lead-silver-gold-copper concentrates recovered as byproducts in the beneficiation of fluorspar at 2 plants.
[2] Includes zinc-lead-copper ore, for which the Bureau of Mines is not at liberty to publish separate figures.
[3] From zinc-lead-copper, zinc-lead, zinc, lead, and gold-silver ores.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal.—Continued

B. For ore shipped directly to smelters

	Ore (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Boulder	473	752	6,860	500	15,852	
Chaffee	491	214	2,605	2,000	152,103	
Clear Creek	55	58	2,724	402	10,242	
Custer	33	1	348		10,000	
Dolores	307	7	1,844	2,000	161,550	
Eagle	15,630	5,080	529,124	609,398	180,959	
Gilpin	15	15	144		1,800	
Gunnison	195	9	3,865	200	67,700	
Hinsdale	49	19	982	672	21,565	
Lake	18,940	516	49,470	4,696	1,079,396	
La Plata	16	61	1,443			
Larimer	8	11	19			
Mineral	1,891	22	66,581	3,187	95,333	
Montezuma	111	215	1,180	2,000		
Ouray	825	22	39,158	37,123	114,504	
Park	242	40	1,453	700	56,452	
Pitkin	138	14	4,739		12,417	
Saguache	637	25	12,212	41,746	235,840	
San Juan	426	98	4,500	8,592	102,005	95,643
San Miguel	2	14	12	400	32	
Summit	848	37	30,355	1,816	280,682	
Teller	707	2,334	1,310			
Total: 1950	42,039	9,564	760,928	715,432	2,598,432	95,643
1949	23,704	4,935	275,900	385,691	2,233,412	46,190
BY CLASS OF ORE						
Dry gold	1,338	3,444	9,526	2,500	16,110	
Dry gold-silver	15,705	5,083	530,606	609,438	184,599	
Dry silver	7,441	135	106,960	9,171	506,842	
Copper	599	27	12,971	64,260	26,947	
Lead	16,624	780	97,284	22,305	1,783,641	
Lead-copper	1	7	109	131	108	
Total to copper and lead plants	41,708	9,476	757,456	707,805	2,518,247	
Zinc-lead ore to zinc plants	331	88	3,472	7,627	80,185	95,643
Total 1950	42,039	9,564	760,928	715,432	2,598,432	95,643

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	296	3,181	5,030	4,727	9,338	
Dry gold-silver	88	187	2,998	542	7,992	2,366
Copper	6,276	13,990	197,449	3,104,088	519,048	779,282
Lead	50,732	45,708	2,268,837	2,306,338	50,742,800	4,046,121
Lead-copper	167	54	9,317	40,202	146,831	42,490
Dry iron [1]	751	4,306	33,435	7,454	633,417	40,545
Total to copper and lead plants	58,310	67,426	2,517,066	5,463,351	52,059,426	4,910,804
Zinc concentrate to zinc plants	100,893	5,436	259,166	818,017	2,264,712	102,231,983
Total: 1950	159,203	72,862	2,776,232	6,281,368	54,324,138	107,142,787
1949	179,013	52,887	2,682,673	5,035,728	54,607,374	111,449,253

[1] From zinc-lead-copper, zinc-lead, zinc, lead, and gold-silver ores.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content.—Continued

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE SHIPPED DIRECTLY TO SMELTERS						
Dry gold	1,338	3,444	9,526	4,279	28,906	458
Dry gold-silver	15,705	5,083	530,606	676,837	235,432	52
Dry silver	7,441	135	106,960	11,673	528,656	30,243
Copper	599	27	12,971	65,626	44,913	1,166
Lead	16,624	780	97,284	27,686	1,860,099	91,554
Lead-copper	1	7	109	164	112	
Total to copper and lead plants	41,708	9,476	757,456	786,265	2,698,118	123,473
Zinc-lead ore to zinc plants	331	88	3,472	8,973	81,572	132,114
Total: 1950	42,039	9,564	760,928	795,238	2,779,690	255,587
1949	23,704	4,935	275,914	437,196	2,333,462	113,197

REVIEW BY COUNTIES AND DISTRICTS

ADAMS COUNTY

Gold and silver were recovered as byproducts in sluices operated by Kerkling and Slensker at the Brannan Sand & Gravel Co. washing plants 8 and 10 and the Superior Sand & Gravel Co. pit, all on gravel bars of Clear Creek northwest of Denver.

BOULDER COUNTY

Central (Jamestown) District.—The Ozark-Mahoning Co. and the General Chemical Co. shipped lead-silver-gold-copper concentrates recovered as byproducts in the beneficiation of fluorspar. A little gold ore was shipped from the Last Chance mine.

Gold Hill District.—The Cash mine, operated by Henna Mines, Inc., produced 1,369 tons of ore, of which 935 tons were shipped to the Front Range mill at Idaho Springs and 434 tons (averaging 1.46 ounces of gold and 14.95 ounces of silver to the ton and 1.87 percent lead) were shipped crude to the Leadville smelter. A little gold ore, removed in development, was shipped from the St. Paul claim. Placer gold was recovered as a byproduct in launders at a sand and gravel plant on the George Sawhill ranch.

Grand Island District.—The Consolidated Caribou Silver Mines, Inc., operated the Caribou mine and 100-ton mill. Ore treated totaled 7,606 tons yielding 154 tons of concentrate containing 159 ounces of gold, 58,262 ounces of silver, 4,899 pounds of copper, 70,988 pounds of lead, and 43,830 pounds of zinc; the zinc was not recovered, as the concentrate was shipped to a lead smelter. The net return from the concentrate sold was $59,778. Development in 1950 included 91 feet of winze, 1,916 feet of drifts, 210 feet of tunnel, and 743 feet of diamond drilling. Exploration was done on a vein containing pitchblende. A new vein, the Nelson, was opened on the 1,040-foot level.

Sugar Loaf District.—The Wood Mountain gold mine was operated

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Colorado in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore sold or treated (short tons)	Gold [1] (fine ounces)	Silver [1] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Adams County		3		909	137				$31,939
Boulder County:									
Central (Jamestown)	3		2	[2] 103	[2] 8,520	[2] 23,500	[2] 217,000		[2] 45,499
Gold Hill	2	1	1,369	825	8,764	500	16,600		39,152
Grand Island	1		7,606	159	58,262	4,000	68,000		68,307
Sugar Loaf	4		991	566	980		8,400	6,000	22,683
Chaffee County:									
Chalk Creek	2		54	17	338	200	7,600	4,000	2,537
Granite	2		5	5	8		200		209
Monarch	3		469	195	2,455	1,800	150,200		29,698
Clear Creek County:									
Alice and Empire	3		101	27	54	1,000	700	500	1,368
Argentine and Griffith	8		4,794	135	14,839	5,500	232,700	177,800	75,961
Cascade	1		200	49	105		200		1,837
Idaho Springs	13		9,255	2,494	29,415	12,900	237,300	125,000	166,381
Montana	1		922	33	23,434	3,600	76,700		33,467
Trail Creek or Freeland (Lamartine)	4		18,736	560	16,398	3,000	80,400	700	46,018
Custer County: Hardscrabble	3		33	1	348		10,000		1,700
Dolores County:									
Lone Cone	1		5	1	19				52
Pioneer	4		14,419	70	72,716	70,000	2,276,000	2,730,000	777,742
Eagle County: Red Cliff	3		224,376	5,636	669,461	652,000	4,220,000	39,912,000	7,175,976
Fremont County: Cotopaxi	1		33	1	21			8,000	1,190
Gilpin County:									
Northern	1		2	2					70
Southern	6	12	108	82	315		6,000		3,965
Gunnison County:									
Elk Mountain	4		336	2	2,180	2,800	35,900	65,000	16,702
Gold Brick	2		101	49	32		200		1,771
Quartz Creek	1		6		126	100	500		202
Taylor Park (Tin Cup)	3		185	4	3,728	100	67,000		12,580
Tomichi	1		12,342	40	67,215	37,000	1,290,400	1,925,000	517,483
Hinsdale County:									
Galena	4		149	6	1,126	1,800	36,400	8,500	7,724
Lake	2		34	17	591	200	9,600	1,500	2,681
Jefferson County:		5		137	21				4,814
Lake County:									
California (Leadville)[3]	16	1	160,618	20,993	280,621	304,000	12,784,000	14,784,000	4,877,131
Granite	2		4	7	11				255
Twin Lakes		1		8	1				281
La Plata County: California	2		16	61	1,443				3,441
Larimer County: Masonville	1		8	11	19				402

Mineral County: Creede	2	------	47,072	803	345,247	68,000	2,844,000	1,746,000	986,587
Montezuma County	1	------	111	215	1,180	2,000	------	------	9,009
Ouray County:									
Red Mountain	9	------	1,391	31	43,907	51,200	187,000	90,000	89,498
Sneffels	4	------	46,300	4,946	185,846	314,200	1,731,300	1,620,400	870,486
Uncompahgre	5	------	2,136	23	8,268	14,600	281,700	107,600	64,633
Park County:									
Alma Placers-Fairplay	------	3	------	15,018	2,527	------	------	------	527,917
Buckskin	1	------	1,562	1,250	7,142	27,100	48,500	498,000	133,115
Consolidated Montgomery	3	------	122	39	516	400	28,100	2,000	5,992
Horseshoe	1	------	163	2	999	300	37,200	------	6,058
Mosquito	1	------	44	12	179	200	2,200	10,000	2,341
Pitkin County:									
Independence	1	------	7	14	12	------	------	------	501
Lincoln Gulch	1	------	1	------	31	------	500	------	96
Roaring Fork	1	------	3,181	------	30,820	------	126,000	42,000	50,868
Spring Butte	1	------	15	------	6	------	7,500	------	1,017
Saguache County:									
Crystal Hill	1	------	18,712	578	326	------	100	------	20,539
Kerber Creek	5	------	3,255	111	30,016	48,000	807,900	464,000	215,989
San Juan County:									
Animas	14	------	261,856	12,874	564,321	622,000	6,138,700	1,921,000	2,192,212
Eureka	11	------	16,296	1,028	31,828	68,000	645,300	669,000	261,043
San Miguel County:									
Iron Springs	2	------	32,360	1,048	89,268	42,000	314,800	1,000	168,848
Lower San Miguel	1	1	2	3	4	400	------	------	192
Upper San Miguel	6	------	432,022	52,567	730,860	3,863,600	15,559,200	17,761,000	7,927,493
Summit County:									
Breckenridge	5	3	4,359	312	11,132	1,200	693,500	854,500	236,207
Green Mountain	2	------	410	6	18,462	500	13,900	37,800	24,268
Montezuma	12	------	6,237	53	55,451	10,500	895,300	129,800	193,521
Ten Mile	4	------	35,197	473	68,289	23,800	1,819,300	5,849,900	1,159,601
Teller County: Cripple Creek	4	------	2,654	5,779	1,938	------	------	------	204,019
Total Colorado	202	30	1,372,744	130,390	3,492,278	6,282,000	54,014,000	91,552,000	29,323,268

[1] Bureau of Mines not at liberty to show separate figures for placer production by districts in 1950.
[2] Includes amounts recovered from lead-silver-gold-copper concentrates produced as byproduct of beneficiation of fluorspar at 2 plants.
[3] Placer gold and silver from Box Creek district and small quantity of gold and silver from Sugar Loaf district are included with the California (Leadville) district.

by Harrison S. Cobb 9 months in 1950; the ore produced was shipped to the Front Range mill in Clear Creek County. Donald Scruggs shipped 20 tons of zinc-lead ore from the Albion J. mine. Gold ore was shipped from the Melvina (Front Range) and Nancy mines.

CHAFFEE COUNTY

Chalk Creek District.—At the Mary Murphy mine S. E. and W. E. Burleson repaired surface buildings and installed a compressor at the portal of the tunnel on the 1,400-foot level, retimbered the caved portal, and began work in the mine late in December 1950. Ore shipped during the year totaled 30 tons containing zinc, lead, silver, and gold. Some zinc-lead-silver ore was shipped from the St. Elmo-Stonewall group.

Granite District.—Wenger, Green & Brazil shipped 4 tons of gold ore from their property, and Carl Frederick shipped 1 ton of gold-silver-lead ore from the Marion Bell claim.

Monarch District.—The Garfield mine, owned by S. E. and W. E. Burleson, was under development, with intermittent production, throughout 1950. Shipments of ore totaled 457 tons containing 195 ounces of gold, 2,197 ounces of silver, 1,928 pounds of copper, and 151,830 pounds of lead. The Iron Duke and Neglected mines shipped a few tons of lead-silver ore.

CLEAR CREEK COUNTY

Alice (Lincoln) District.—Robert Kahl cleaned out 100 feet of tunnel at the Mary B mine and shipped some ore.

Argentine District.—Screened dump ore shipped from the Stevens property to the Black Eagle mill near Idaho Springs yielded lead-silver-gold concentrate and zinc concentrate.

Cascade District.—About 200 tons of gold-silver ore were shipped from the Humboldt-Mary Foster group.

Empire District.—The P. M. Leasers continued work (mostly prospecting) on the Gold Fissure group until July 10 and shipped some ore. At the Silver Spoon claim ore amalgamated by hand methods yielded a little gold.

Griffith District.—The Terrible-Dunderberg group was under development, with intermittent production, by Gold Mines Consolidated, Inc., throughout 1950. Ore shipped totaled 1,039 tons, from which were recovered 195 tons of combined lead and zinc concentrates containing altogether 23 ounces of gold, 5,838 ounces of silver, 2,126 pounds of copper, 121,891 pounds of lead, and 127,115 pounds of zinc. Lessees at the Griffith mine shipped 222 tons of lead-zinc-silver ore. Sample lots of ore removed in development at the Rio Grande property were treated in the Commonwealth mill. Other small producers included the Dives-Pelican, Endeavor, Silver Cloud-Copper Bottom, and Smuggler groups.

Idaho Springs District.—The Franklin mine was a consistent shipper of lead-zinc-silver-gold ore to custom mills in 1950. The Dixie mine of LeRoy Giles & Co. continued to be the only substantial producer of gold ore in the county; the ore was treated in the company mill, which also treated custom ore. The Front Range Mines, Inc., operated the Mattie-King Solomon group. The Black Eagle mill operated on custom ores. Small tonnages of ore were shipped from the Consolidated Park, Diamond Joe, Kitty Clyde, Oregon, Rainbow Draper, and Specie Payment mines and from several prospects and dumps.

Montana District.—The Nabob Development Co. shipped 922 tons of ore containing 33 ounces of gold, 23,434 ounces of silver, 4,523 pounds of copper, and 79,957 pounds of lead. The Front Range Mines, Inc., operated its mill near Dumont on company and custom ores from mines in Clear Creek, Boulder, and Teller Counties.

Trail Creek District.—The Montana Mining & Development Co. cleaned out tunnels and remodeled the mill at the Lamartine mine and used the mill to treat about 18,000 tons of gold-silver-lead ore from the dump. Other small producers were the Gum Tree, Turner, and Valentine mines.

CUSTER COUNTY

Hardscrabble District.—Small lots of lead-silver ore were shipped by Hartley & Landin and R. E. Kemper. Lessees began working the Defender mine in October and shipped 29 tons of lead-silver ore.

DOLORES COUNTY

Lone Cone District.—About a truckload of gold-silver ore was shipped from the Geyser claim.

Pioneer (Rico) District.—The Rico Argentine Mining Co., which suspended mining ore at its group of mines in May 1949, continued to work mostly on development from January to July 1950 and then resumed regular mining and milling operations. The mine is an important producer of zinc, lead, and silver. Ore from the Forest-Wedge and Sambo mines was shipped to custom plants outside the county. Some gold ore from the St. Louis mine was amalgamated.

EAGLE COUNTY

Red Cliff (Battle Mountain) District.—This district was again much the largest producer of zinc in Colorado; it was also a large producer of silver and a substantial producer of copper, lead, and gold. The district output of all five metals was larger than in 1949. The Eagle mine of the New Jersey Zinc Co., Empire Zinc Division, on Battle Mountain operated continuously in 1950. Some facts regarding this large producer were published.[1] The principal ore bodies occur as replacements in a flat-dipping bed of limestone. They are generally massive occurrences, with a core of iron-copper-silver-gold ore surrounded by an outer layer of zinc-lead ore. The mine is developed through a tunnel; a vertical shaft bottomed on the sixteenth, or tunnel, level (used to hoist and lower men and supplies); and a series of inclines, two of which bottom on the twentieth level and one on the twenty-fourth level. The mine is completely mechanized. Electric battery motors are used for haulage throughout the mine. The ore feed to the mill is about 47 tons per hour. The mill is underground, in an excavation in granite at the portal of the tunnel. The main room is 330 feet long, 52 feet wide, and 22 to 56 feet high. In the

[1] Brochure distributed by the New Jersey Zinc Co. to its employees, 1949.
Engineering and Mining Journal, Modernizing New Jersey Zinc's Eagle Mill, pt. 1: Vol. 151, No. 10, October 1950, pp. 80–85; pt. 2, vol. 151, No. 11, November 1950, pp. 101–105.

mill area are also underground shops, storage rooms, blower and drier rooms, a mine service incline, an ore-storage pocket for zinc-lead milling ore, and three ore-storage pockets and a loading tunnel for copper-silver-gold ore shipped direct to smelters.

The Curran lode near Redcliff shipped a small lot of gold ore, and the Morning mine 10 miles southwest of Redcliff shipped 64 tons of zinc-lead-silver ore.

EL PASO COUNTY

Material cleaned up at the Golden Cycle mill site yielded gold and silver, which was credited to the production of the Cripple Creek district, Teller County.

FREMONT COUNTY

Cotopaxi District.—The Pastoro Mining Co. shipped a small tonnage of zinc ore from the Cotopaxi mine.

GILPIN COUNTY

Northern Districts.—A little gold was recovered from ore removed in development at the We Got Em mine.

Southern (Blackhawk, Central City, Nevadaville, Russell Gulch) Districts.—Small quantities of lead-silver and lead-silver-gold ore were shipped from the Arris, Independence, and Jennie Blanche mines, and some gold-silver-lead ore from the West Notoway dump was treated in the Gold Ridge mill. Several lots of gold-bearing clean-up material were shipped from other properties. Placer gold was recovered by hand methods on North Clear Creek.

GUNNISON COUNTY

Elk Mountain District.—At the Keystone mine the Park City Consolidated Mines Co. continued an exploration and development project begun in 1949. Work done in 1950 included 600 feet of drifting and 1,000 feet of churn drilling. Some zinc-lead-silver ore removed in development was shipped. The Slate River Mining Co. operated the Eureka mine on Treasury Mountain 18 miles northwest of Crested Butte from July 1 to October 1. Ore shipped totaled 123 tons containing 46,398 pounds of zinc, 9,612 pounds of lead, 2,358 pounds of copper, and 810 ounces of silver. The Crested Butte Mining & Milling Corp. worked about 8 months on reopening the Daisy group. Most of the time was spent in building a road, erecting surface buildings, installing machinery, and in cleaning out and retimbering in the mine. Production was 84 tons of zinc-lead-silver ore. At the Independence mine Robert S. Palmer cleaned out two tunnels, installed track, and shipped 27 tons of zinc-lead-silver ore.

Gold Brick District.—A 4-ton lot of gold-silver-lead ore was shipped from the Victor mine. Ore produced at the Carter mine in December yielded some gold and silver.

Quartz Creek District.—A. L. Pearson reported a truckload shipment of complex silver-lead-zinc-copper ore from his Shady Side claim.

Taylor Park (Tin Cup) District.—The Star mine, worked by John Lambertson, shipped 144 tons of ore containing 68,430 pounds of lead, 3,648 pounds of zinc, 2,711 ounces of silver, and 2 ounces of gold. Other small producers were the Enterprise and Shadow claims.

Tomichi District.—The Akron-Erie mine and 100-ton flotation mill of the Callahan Zinc-Lead Co., Inc., at White Pine were active throughout 1950, but operations were on a curtailed basis part of the year. Output of zinc and lead concentrates was therefore less than in 1949. Ore treated totaled 12,342 tons, from which were recovered 869 tons of lead-silver concentrate averaging 0.025 ounce of gold and 62.46 ounces of silver to the ton, 66.31 percent lead, 9.16 percent zinc, and 1.19 percent copper; and 2,138 tons of zinc concentrate averaging 0.014 ounce of gold and 9.32 ounces of silver to the ton, 51.13 percent zinc, 7.18 percent lead, and 0.61 percent copper. Mine development during the year totaled 1,179 feet of drifts, 168 feet of crosscut, and 813 feet of raises; in addition, 675 feet of old drifts were rehabilitated.

HINSDALE COUNTY

Galena District.—Small-scale producers shipped a total of 149 tons of lead-silver and zinc-lead-silver ore in 1950. The ore came from the California, Ulay, and Yellow Medicine mines and the Crook smelter dump.

Lake District.—Output in 1950 comprised 27 tons of lead-silver-gold ore from the W. C. Garlock mine and 7 tons of zinc-lead-silver ore from the Sunflower.

JEFFERSON COUNTY

Placer gold was recovered as a byproduct in sluices at three commercial sand and gravel washing plants on Clear Creek, and a little gold was produced by placer miners.

LAKE COUNTY

Box Creek District.—In 1950 the General Gold Corp. operated its Mount Elbert placers, using two dragline dredges and bulldozers, during the open season, which lasted from May 1 through November.

California (Leadville) District.—Production of gold, silver, copper, lead, and zinc in the Leadville district increased sharply in 1950 over 1949. The Resurrection mine group, reopened in January 1942 by the Resurrection Mining Co. after an extensive development campaign, has been the only large-scale producer of zinc-lead ore from underground mines in the Leadville district since the Leadville Deep Mines Co. properties closed in 1931. Chiefly through operation of the Resurrection mine, the Lake County output of lead and zinc rose from a yearly average of 1,030 tons of lead and 579 tons of zinc in the period 1932 through 1941 to 4,893 tons of lead and 6,071 tons of zinc in the period 1942 through 1950. The zinc-lead ore from this mine has also yielded most of the county output of gold and silver since 1942. In 1950 improvements in the Resurrection mill raised its capacity, and the flow sheet was rearranged to permit treatment of custom ore in a separate unit. The custom ore came from Boulder, Chaffee, Clear Creek, Fremont, Gunnison, Lake, Mineral, Park, Saguache, and Summit Counties.

The American Smelting & Refining Co. closed its 400-ton Leadville milling unit April 19, 1950. The mill had been in operation since July 3, 1945, on ores from the company Kokomo unit in Summit County and custom ores from Lake, Summit, and other counties.

The company continued exploration and development on the Ibex-Garbut-Cora-Sunday group at Leadville and shipped considerable ore from this group.

Other Leadville shippers of ore to custom mills and smelters included the Fortune mine (a partnership), New Monarch-Valley, Dolly B, Rock Hill dumps, St. Louis, Chautauquan, Little Alice, Moyer, and American smelter dump. The Cadwell Mining Co. reopened the Hayden shaft and did development work in the mine.

The Arkansas Valley smelter of the American Smelting & Refining Co. operated continuously. Material treated included lead, lead-copper-gold-silver, and gold and silver ores and concentrates purchased from operators in all the active lode-mining districts of Colorado; and concentrates, residues from zinc smelters, and other material from outside the State. Receipts in 1950 totaled 101,701 tons compared with 103,386 tons in 1949. Work progressed on the company plant-improvement program; new installations include a copper-drossing unit, improved sinter-handling system, spray house for the Cottrell section, slag-granulation unit, and improved exhaust system at the roasters.

Early in 1950 the Bureau of Mines completed specifications for a contract to extend the Leadville drainage tunnel but found no contractor who was willing to bid a definite price. A negotiated contract with the Utah Construction Co. was signed August 16, and drilling at the tunnel heading 6,600 feet from the portal was begun September 20. On December 20, 1950, the heading was 7,440 feet from the portal.

Granite District.—A small output of gold and silver was made from the Millie G No. 1 and Wichita claims.

Sugar Loaf District.—A little gold-silver ore was shipped from the Lakewood mine.

Twin Lakes District.—The Goff placer on Lake Creek was worked a short period in 1950 by the Cripple Creek Mining & Milling Co.

LA PLATA COUNTY

California (La Plata, Hesperus) District.—Some gold ore from the Bessie G. mine and silver ore from the Muldoon were shipped in 1950.

LARIMER COUNTY

Masonville District.—Gold-silver ore was shipped from the Little Mary Mason mine.

MINERAL COUNTY

Creede District.—The Emperius Mining Co. operated its group of mines and 100-ton selective flotation mill continuously and at a higher production rate in 1950 than in 1949. The group, which includes the Amethyst, Commodore, New York-Volunteer-Del Monte-Aspen, and Equinox properties, ranked fourth in the State in silver production. Formerly the ore mined was valued chiefly for its silver content, but in 1949 and 1950 the value of the combined lead and zinc recovered exceeded that of the silver. The ore also carries gold and copper. Development during the year included 1,702 feet of raises, 2,089 feet of drifts, and 1,552 feet of tunnel. The Solomon Lease operated the Ethel-Solomon group from October 1 through December.

MONTEZUMA COUNTY

Animas Minerals, Inc., shipped gold-silver ore containing some copper from the Gold Dollar mine in the California district, part of which is in Montezuma and part in La Plata County.

OURAY COUNTY

Red Mountain District.—Melvin Brugger operated the Genessee tunnel throughout 1950 and shipped silver-copper-lead and zinc-lead-silver-copper ores. The Patsy and Lost Day mines of the Morningside Development Co. shipped high-grade silver-lead ore. Other small producers included the Beaver-Belfast, Hope, Kentucky Giant, Koehler-San Antonio, Monte Cristo, South Dakota Lode, and Stanley-Kremlin-J. I. C. properties. The Idarado mill treated ore from claims in San Miguel County.

Sneffels District.—The Camp Bird mine, operated by King Lease, Inc., was again the leading producer of gold, silver, copper, lead, and zinc in Ouray County. This mine, famous as a gold and silver producer since 1896, has recently been yielding zinc-lead ore, with accessory gold, silver, and copper. The mine has more than 7 miles of underground workings. Ore treated in 1950 totaled 46,163 tons compared with 38,755 tons in 1949. Smaller producing mines in the Sneffels district included the Atlas-San Pedro, Snowflake, and Tom Patterson.

Uncompahgre District.—Most of the output of metals from this district in 1950 came from the Mickey Breen (Monarch) mine, operated throughout the year by Southwest Metals, Inc. Small tonnages of ore were shipped from the Auxiliary, Bachelor, Newsboy, and Silver Bell properties. All the district output of ore was treated in the 300-ton custom mill of the American Zinc, Lead & Smelting Co. at Ouray. The mill also treated ore purchased from other mines in Ouray, Hinsdale, San Juan, San Miguel, and Dolores Counties.

PARK COUNTY

Alma Placers-Fairplay District.—The South Platte Dredging Co. operated continuously its electrically powered connected-bucket dredge (108 12-cubic-foot buckets) on South Platte River near Fairplay and ranked fourth in the State in gold production. Gravel washed totaled about 4,600,000 cubic yards, and output of gold increased materially over 1949. The Platte River Placer, Inc., operating a dry-land dredge on the Alma Placers from July to October, washed 40,000 cubic yards of gravel. Some gold was recovered by hand methods on the Gumaer placer.

Buckskin District.—The Phillips group, owned and operated by the Buckskin Joe Mines, Ltd., continued to ship ore to the Resurrection mill at Leadville. Production in 1950 was 1,562 tons of ore containing 1,481 ounces of gold, 8,004 ounces of silver, 55,004 pounds of copper, 54,248 pounds of lead, and 726,952 pounds of zinc.

Consolidated Montgomery District.—The 122 tons of ore shipped from this district in 1950 came from three properties—the Rocky Mountain Diamond Drilling Co. claims, the F. A. Woeber group, and the Wheeler group.

Horseshoe District.—Lessees at the Last Chance mine shipped 163 tons of ore containing 38,659 pounds of lead, 999 ounces of silver, 6,080 pounds of zinc, 403 pounds of copper, and 2 ounces of gold.

Mosquito District.—M. J. Krolicki shipped 44 tons of zinc-lead-silver-gold ore from the Orphan Boy mine in 1950. At the London Butte property development work was continued until about the end of the year.

PITKIN COUNTY

Independence District.—A lessee at the Mount Hope mine shipped 7 tons of gold-silver ore in 1950.

Lincoln Gulch District.—W. K. Martz shipped a ton of high-grade lead-silver ore from his Mascot mine.

Roaring Fork (Aspen) District.—The Midnight Mining Co. continued to operate its Midnight mine. Ore milled in 1950 totaled 3,066 tons (wet weight), which yielded 151 tons of lead concentrate averaging 166.20 ounces of silver a ton and 40.49 percent lead; and 62 tons of zinc concentrate averaging 38.95 percent zinc and 25.66 ounces of silver a ton. Crude ore shipped direct to the Leadville smelter totaled 115 tons averaging 40.74 ounces of silver a ton and 2.18 percent lead. The Bureau of Mines published the results of its investigation of the Smuggler mine.[2]

Spring Butte (Redstone) District.—Some lead ore was shipped from the C. & M. property in 1950.

SAGUACHE COUNTY

Crystal Hill District.—The Crystal Hill-Esperanza gold mine was worked from March to August 1950 by the Crystal Hill Mining Co. The ore mined was low-grade and was treated by flotation and amalgamation of the flotation concentrate in the company mill built near the mine in 1949.

Kerber Creek (Bonanza) District.—The Antoro mine, operated by S. E. and W. E. Burleson, shipped 2,226 tons of ore containing 86 ounces of gold, 15,697 ounces of silver, 540,231 pounds of lead, and 576,975 pounds of zinc. W. J. Costello continued to operate the Rawley group and shipped 903 tons of ore containing 35 ounces of gold, 15,855 ounces of silver, 52,163 pounds of copper, 339,423 pounds of lead, and 135,730 pounds of zinc. Some ore was shipped from the Cocomongo (mined late in 1949), Cora, and Little Jenny mines.

SAN JUAN COUNTY

Animas District.—The Shenandoah-Dives Mining Co., operating its Shenandoah-Dives consolidated group of mines and the leased Silver Lake group as a unit, continued to be much the largest producer of ore in San Juan County. Mine development in 1950 included 1,383 linear feet of drifts, 24 feet of raises, and 342 feet of diamond drilling. Stoping totaled 320,073 square feet. The mine is connected with the company 700-ton mill by an aerial tram nearly 2 miles long. Company ore milled in 1950 totaled 202,947 and cus-

[2] Volin, M. E., and Hild, J. H., Investigation of Smuggler Lead-Zinc Mine, Aspen, Pitkin County, Colo.: Bureau of Mines Rept. of Investigations 4696, 1950, 47 pp.

tom ore 4,530 tons, compared with 186,072 and 15,259 tons, respectively, in 1949. The yield of concentrates from the 207,477 tons of ore treated in 1950 was 4,130 tons of flotation lead concentrate, 1,501 tons of flotation zinc concentrate, and 667 tons of iron-gold-silver-lead table concentrate containing in aggregate 10,588 ounces of gold, 427,725 ounces of silver, 707,701 pounds of copper, 3,702,622 pounds of lead, and 2,155,501 pounds of zinc.

The Pride of the West 100-ton flotation mill operated throughout 1950, mostly on ore from the Great Eastern, Pride of the West, and Green Mountain mines; both lead and zinc concentrates were produced. The Highland Mary mine, equipped with a 100-ton mill, operated during the open season and shipped bulk lead-silver-gold concentrate. The Osceola Mining & Milling Corp. treated custom ores in the Lackawanna mill. The Old Hundred Gold Mining Co. rebuilt aerial tram terminals and eight cable-carrying towers, worked on repairing its flotation mill and shipped some ore from its Gary Owen group to custom mills. Other shippers of ore to custom mills and smelters included the Copper Queen, May Day, Mohawk, Molas, Mystery, Silent Friend, Silver Ledge, Winnemuca, and Zuni (dump) properties.

Eureka District.—The Columbus (Foursome) group shipped nearly 2,000 tons of ore to custom mills and produced additional ore that was treated in a small mill at the mine. The Lead Carbonate mine and 40-ton mill continued to operate; ore milled totaled 9,952 tons compared with 5,500 tons in 1949. The Bonita Mining & Developing Co. acquired the Pride of Bonita and Minnehaha groups and worked mostly on reopening and reconditioning old mine workings, installing equipment, and development; the company shipped some ore from each of the properties. Other producers included the Black Hawk, Burrows, Galena Queen, Great Eastern, Mastadon (dump), Occidental, and Queen Anne mines. The Bureau of Mines did exploratory drilling in the Ross Basin area during the open season there.

SAN MIGUEL COUNTY

Iron Springs District.—The Silver Bell group, worked since 1946 by the Silver Bell Mines Co., was in production throughout 1950, although operations were hampered in December when a fire destroyed the compressor house and change house. The ore was treated in the company 150-ton flotation mill, the product of which is bulk gold-silver-lead-copper concentrate. A screening-washing-sorting plant was built in 1950. Mine development included 1,999 feet of drifts and 16 feet of raise. Belisle & Reed shipped some ore from the New Dominion mine.

Lower San Miguel District.—The Bonanza No. 1 claim produced a little copper-silver ore, and a small placer yielded gold.

Upper San Miguel District.—Continued expansion of operations of the Idarado Mining Co. on the Treasury Tunnel-Black Bear-Ajax group and of Telluride Mines (Inc.) on the Smuggler Union-Montana group in 1950 put the Upper San Miguel district ahead of any other Colorado district in production of gold, silver, copper, and lead and raised it to second rank in zinc. The district output of the base metals was higher than in any previous year.

The Idarado mill is in Ouray County, at the portal of the 12,000-foot Treasury tunnel, which extends to the Black Bear-Ajax workings in San Miguel County. A 1,100-foot raise on the Black Bear vein connects the upper workings with the tunnel level. Another tunnel (old Meldrum), with its portal near Telluride, is being extended to explore the Idarado property at greater depth. The consolidated group includes the old Black Bear, Treasury tunnel, Argentine, Ajax, Barstow, Imogene, and other properties, comprising about 370 claims. The ore is crushed in an underground primary crushing plant before being transported to the mill. The capacity of the mill, formerly 500 tons daily, has been increased to nearly 1,000 tons. The tonnage of ore treated in 1950 increased 40 percent over 1949. The mill products are copper concentrate, lead concentrate, and zinc concentrate (all enriched by gold and silver), and gold-silver bullion (obtained by amalgamating a jig hutch product).

At the Smuggler Union-Montana group, output of ore increased, and the extensive development program begun in 1945 to open the Smuggler Union and Montana veins below former workings neared completion. A master raise and an ore chute (with a 50-foot pillar between the two) connecting the new 2-mile mill-level tunnel with the Pennsylvania-level workings on the Montana vein about 1,180 feet above were nearly finished. Other development during 1950 included 5,781 feet of drifting and 510 feet of diamond drilling. New equipment installed in the mill included a 42-inch Pan-American Duplex jig and a Wilfley table. In treatment the crushed ore is ground in a Marcy ball mill and discharged over the Pan-American jig. The jig concentrate goes to a Denver cleaner jig. The cleaner jig concentrate is amalgamated, and the cleaner jig tailings go to a table. High-grade table concentrate is shipped to a smelter, and the table tailings go to the ball mill. The Pan-American jig tailings go to lead flotation and the lead tailings to zinc flotation.

Lessees on the Tomboy dump treated ore in a 15-ton table mill. The East Ridge Co. worked the Andrus mine from June 15 to October 5 and shipped 287 tons of ore containing 37.3 ounces of gold, 595 ounces of silver, 3,760 pounds of copper, 39,060 pounds of lead, and 39,940 pounds of zinc. Small lots of gold bullion, recovered by hand methods from high-grade ore, were shipped from the Alleghany and Blixt claims.

SUMMIT COUNTY

Breckenridge District.—The Wellington group, operated by W. L. Davenport, was a steady shipper of zinc-lead-silver ore to custom mills at Leadville. Davenport also operated the Minnie group about 6 months and produced 1,000 tons of ore, which was concentrated in a jig mill at the mine. Other small producers were the Greenwood, Jessie, Little Fool, and Maenke lode properties and three placers.

Green Mountain District.—Zinc-silver ore from the Big Four mine of Frances L. McDaniel and high-grade silver ore containing some lead from the First Chance (operated by John J. McDaniel) were shipped in 1950.

Montezuma District.—Jeffrey & Ulibarri produced ore from the New York, Quail, Silver King, and Waterloo claims and operated the Plymouth mill. The Teller Basin Mining & Milling Co. operated the Chautauqua mine throughout 1950 on a small scale, treating the ore in the company mill. The Florado Mining Co. operated its Pinnicle mine part time with two men; the ore produced was shipped to custom plants, as the company mill was destroyed by fire. Other shippers to custom plants at Leadville were the Allen Emory (Brooks-Young Mining Co.), Ida Belle, Manerva, Mohawk, Radical, Silver Wing, Wauneita, and Wild Irishman mines.

Ten Mile (Kokomo, Robinson) District.—The Victory-Lucky Strike-Wilson-McKinley group of mines, operated continuously since September 1944 by the American Smelting & Refining Co., was closed April 19, 1950. In 1949 this group was the largest producer of lead and the second-largest producer of zinc in the State and ranked fourth in silver production; it also produced gold and copper. Although operated only 3½ months in 1950, this group was the largest Summit County producer of all five metals. The Colonel Sellers mine was worked on a small scale most of the year. Some ore was shipped from the Kimberly and Boston mines.

TELLER COUNTY

Cripple Creek District.—Construction of the new 1,000-ton Carlton custom mill of the Golden Cycle Corp. was almost completed in 1950. The mill represents an investment of more than $1,500,000. A report on design and construction of the mill was published.[3] The virtually fireproof building has about 3½ acres of floor space, including offices, laboratories, and warehouse; it is 438 feet long, with four stories at the front, and extends back 356 feet on the terraced slope housing the mill proper. Labor-saving devices, the latest improvements in equipment, and improved processes in gold recovery (some of them new) that apply to the sulfotelluride ores of the Cripple Creek district are some of the features of the new mill. All the mill feed will be treated by flotation. The concentrate—which will be largely auriferous pyrite, with some gold tellurides—will carry approximately 80 percent of the gold values and will go to the high-grade section of the mill. The flotation tailings will go to the low-grade section for further treatment by "carbon cyanidation." In the high-grade section the concentrate, after being filtered and thickened, will be roasted or calcined in the new type of roaster known as the Dorrco fluosolids reactor. This type of reactor is "self-sustaining"; sulfur in the pyrite concentrate will furnish the fuel to attain the temperature necessary to complete the reaction desired. The calcines from the reactor will be treated by the conventional cyanide-zinc dust precipitation process.

The Cripple Creek mines that shut down early in 1949 to await completion of the Carlton mill generally remained idle or worked only on development in 1950. The Front Range Mines, Inc., trucked ore

[3] Bowen, Max W., Golden Cycle's Modern Mill: Min. Cong. Jour., vol. 36, No. 11, November 1950, pp. 30–33 and 69.

from the Strong mine to the company mill in Clear Creek County for treatment. Some screenings and sorted ore from the El Paso mine (worked by John Robush & Co.) and a small tonnage of ore cleaned up at the Sangre de Cristo-Mollie Kathleen (Markley) mine were shipped to the Leadville smelter. Material cleaned up from the Golden Cycle mill site at Colorado Springs yielded gold and silver, which was credited to the production of the Cripple Creek district. In December the Ajax and Cresson mines began hiring men and putting equipment in shape to resume mining as soon as the Carlton mill was ready to receive ore.

East of the Mississippi River

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

by Samuel A. Gustavson

GENERAL SUMMARY

ANNUAL reports from producers of gold, silver, copper, lead, and zinc in the States east of the Mississippi River showed greater output in 1950 than in 1949 for all of these metals except lead.

Production increases in 1950 can be attributed to a relatively steady output from the larger mines of the region. The drop in lead output was the result of cessation of operations at several small mines in Wisconsin, Southern Illinois, and Kentucky during 1949, closing of the Universal Exploration Co. mine in New York, and a labor strike at the New Jersey Zinc Co. mine in Virginia during 1950.

Output, in terms of recoverable metals, in 1950 was 2,090 fine ounces of gold, 113,355 fine ounces of silver, 40,105 short tons of copper, 8,178 short tons of lead, and 174,507 short tons of zinc. In 1949 the output was 1,967 ounces of gold, 101,612 ounces of silver, 32,955 tons of copper, 9,755 tons of lead, and 156,298 tons of zinc, indicating increases of 6 percent for gold, 12 percent for silver, 22 percent for copper, and 12 percent for zinc and a decrease of 16 percent for lead.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. The prices used for calculating the value of metal production, except for zinc in New Jersey, are shown in table 1. The value of the New Jersey output is the total value of the zinc recoverable as metal and oxide after freight, haulage, smelting, and manufacturing charges are added.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

1 Price under authority of Gold Reserve Act of Jan. 31, 1934.
2 Treasury buying price for newly mined silver, Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
3 Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

Copper prices, Connecticut Valley, opened at 18.5 cents and increased to 19.5 cents in May, 22.5 cents in June, and finally to 24.5 cents in October. Lead opened at 12.0 cents, New York, dropped to a low of 10.5 cents in March, increased to 12.0 cents in May, dropped again to 11.0 cents in July, then gradually increased to 17.0 cents by the end of October. Zinc opened at 9.75 cents and began to rise in March, reaching 15.0 cents in June, then increased to 17.5 cents in September, at which it remained to the end of the year.

Annual figures for the 5 years ended with 1950 and data showing the production of gold, silver, copper, lead, and zinc by months in terms of recoverable metal are given in tables 2 and 3. The figures for tonnage of ore sold or treated before 1949 do not include magnetite ore containing pyrite or chalcopyrite, from which copper, gold, and silver were recovered as byproducts. Minerals Yearbook 1947 (p. 1379), contains an historical table showing mine production of gold, silver, copper, lead, and zinc in States east of the Mississippi River by years for 1906–47. The 1947 volume also contains a table (p. 1380) showing production of gold, silver, copper, lead, and zinc by months for 1943–47. Monthly production data for earlier years are not available.

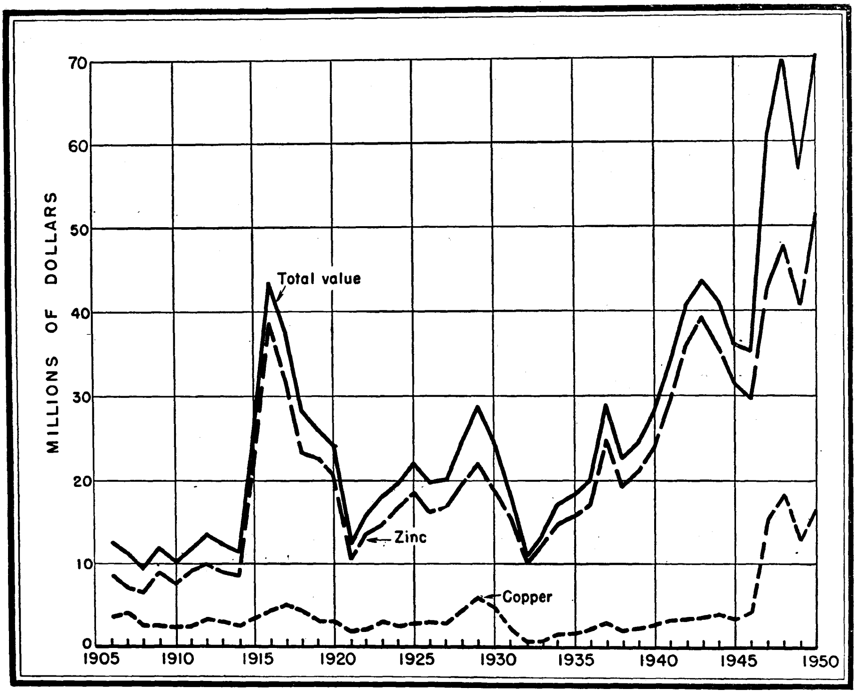

FIGURE 1.—Value of mine production of zinc and copper and total value of gold, silver, copper, lead, and zinc in States east of the Mississippi River, 1906–50.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in States east of the Mississippi River, 1946–50, in terms of recoverable metal [1]

Year	Mines producing		Material sold or treated		Gold (lode and placer) [2]		Silver (lode) [3]	
	Lode	Placer	Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value	Fine ounces	Value
1946	108	5	[4] 5,451,340	3,763,871	1,432	$50,120	79,266	$64,047
1947	120	--------	[4] 6,293,007	3,411,070	1,997	69,895	137,780	124,691
1948	110	--------	[4] 6,544,541	2,349,877	2,479	86,765	101,171	91,565
1949	119	2	7,535,840	2,089,155	1,967	68,845	101,612	91,964
1950	66	--------	8,892,102	2,261,179	2,090	73,150	113,355	102,592

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	34,513	$11,182,212	11,127	$2,425,686	161,876	$35,472,314	$49,194,379
1947	36,875	15,487,500	9,026	2,599,488	181,792	42,810,934	61,092,508
1948	42,025	18,238,850	10,706	3,832,748	177,787	47,696,879	69,946,807
1949	32,955	12,984,270	9,755	3,082,580	156,298	40,560,934	56,788,593
1950	40,105	16,683,680	8,178	2,208,060	174,507	51,190,389	70,257,871

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, or copper precipitates shipped diiectly to smelters during the calendar year indicated.
[2] Includes placer gold as follows: 1946, 22 ounces; 1947–48, none; 1949, 27 ounces; 1950, none.
[3] No placer silver was produced during 1946–50.
[4] Excludes magnetite-pyrite-chalcopyrite ore from Pennsylvania.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in States east of the Mississippi River in 1950, by months, in terms of recoverable metal

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total 1950	Total 1949
Gold (fine ounces):														
Georgia														18
Maryland		10							10				20	
North Carolina														13
Pennsylvania	101	96	111	116	171	161	146	181	146	186	167	182	1,764	1,645
Tennessee	13	12	13	13	12	12	12	15	13	15	15	15	160	171
Vermont	10	10	12	12	12	11	11	12	12	14	17	13	146	120
Total gold	124	128	136	141	195	184	169	208	181	215	199	210	2,090	1,967
Silver (fine ounces):														
Illinois	177	55	129	145	127	99	113	120	133	325	300	278	2,001	3,128
New York	2,282	2,358	4,747	2,762	2,451	1,473	5,935	2,854	1,921	1,922	1,991	1,932	32,628	18,378
Pennsylvania	715	135	760	835	1,095	1,025	900	1,060	905	1,115	1,010	1,008	10,563	10,827
Tennessee	3,161	2,860	3,516	3,333	2,995	2,900	3,092	3,601	3,446	3,745	3,605	3,704	39,958	41,833
Vermont	2,291	2,389	2,742	2,683	2,072	1,988	2,002	2,107	2,183	2,387	3,045	2,316	28,205	27,446
Total silver	8,626	7,797	11,894	9,758	8,740	7,485	12,042	9,742	8,588	9,494	9,951	9,238	113,355	101,612
Copper (short tons):														
Michigan	2,148	2,022	2,352	1,998	2,043	2,510	1,887	2,408	2,028	1,963	2,040	2,209	25,608	19,506
Pennsylvania, Tennessee, Vermont [1]	1,066	980	1,158	1,173	1,189	1,120	1,134	1,323	1,233	1,373	1,403	1,345	14,497	13,449
Total copper	3,214	3,002	3,510	3,171	3,232	3,630	3,021	3,731	3,261	3,336	3,443	3,554	40,105	32,955
Lead (short tons):														
Illinois	173	198	171	158	130	167	212	265	299	311	349	296	2,729	3,824
Kentucky	4	4	4	4	3	6	9	6	5	6	9	6	66	187
New York	121	146	153	128	127	131	89	110	105	121	119	134	1,484	1,317
Tennessee [2]	113												113	257
Virginia	204	222	358	424	323	345	280	398	314	81	72	233	3,254	3,313
Wisconsin	23	25	29	35	37	21	18	30	46	59	93	116	532	857
Total lead	638	595	715	749	620	670	608	809	769	578	642	785	8,178	9,755

Zinc (short tons):														
Illinois	2, 179	2, 040	2, 382	2, 494	2, 518	2, 150	2, 224	2, 433	2, 087	1, 911	2, 062	2, 502	26, 982	18, 157
Kentucky	34	33	41	46	41	58	46	53	46	58	118	157	731	935
New Jersey	--------	4, 946	4, 990	4, 495	4, 569	4, 679	4, 587	4, 993	4, 672	5, 578	5, 826	5, 694	55, 029	50, 984
New York	3, 123	3, 029	3, 624	3, 219	3, 452	3, 084	2, 889	3, 443	3, 017	3, 091	3, 156	3, 194	38, 321	37, 973
Tennessee	2, 515	1, 797	3, 149	2, 953	3, 186	3, 176	2, 418	3, 527	3, 420	3, 176	3, 017	2, 992	35, 326	29, 788
Virginia	1, 299	1, 095	1, 233	1, 132	1, 072	1, 175	1, 153	1, 376	1, 212	317	273	1, 059	12, 396	13, 166
Wisconsin	395	393	502	462	535	479	404	511	475	351	370	845	5, 722	5, 295
Total zinc	9, 545	13, 333	15, 921	14, 801	15, 373	14, 801	13, 721	16, 336	14, 929	14, 482	14, 822	16, 443	174, 507	156, 298

[1] Combined to avoid disclosing individual company operations
[2] Estimated.

Gold.—In the States east of the Mississippi River, most of the gold is recovered as a byproduct of mining copper and is recovered from slimes in the electrolytic refining of this copper. In 1950 production from the region was 2,090 fine ounces compared with 1,967 fine ounces in 1949. In Maryland one gold mine was operated intermittently during 1949 and 1950, producing 20 fine ounces of gold, all of which has been credited as 1950 production. The output of this mine constitutes all the production of gold from gold ores in the region during the year. No gold from placer operations was reported. Byproduct sources in 1950, as has been the case for several years, were magnetite-pyrite-chalcopyrite ore from the Cornwall mine, Lebanon County, Pa.; copper ore from the Elizabeth mine, Orange County, Vt.; and copper-iron-zinc ore from the Tennessee Copper Co. mines, Polk County, Tenn.

TABLE 4.—Mine production of gold in the Southern Appalachian States, 1799–1950

State	Period	Fine ounces	Value	State	Period	Fine ounces	Value
Alabama	1830-1950	49,495	$1,198,985	South Carolina	1829-1950	318,801	$7,562,125
Georgia	1830-1950	870,660	18,088,947	Tennessee	1831-1950	21,755	509,055
Maryland	[1]-1950	6,122	164,640	Virginia	1828-1950	167,558	3,577,509
North Carolina	1799-1950	1,164,601	24,328,298				
				Total	1799-1950	2,598,992	55,429,559

[1] Year of first production not recorded.

Silver.—All the silver produced in 1950 was recovered as a byproduct of zinc-lead, lead-fluorspar, or copper ore (including magnetite-pyrite-chalcopyrite ore). Producing States include Illinois (Southern), New York, Pennsylvania, Tennessee, and Vermont. Small amounts of silver are contained in ores produced in other States in the region but this silver is not usually recovered. Silver is purposely retained in copper produced in Michigan for the physical properties it adds to the copper. Silver recovered from mines in States east of the Mississippi River totaled 113,355 fine ounces in 1950 compared with 101,612 fine ounces in 1949, an increase of 12 percent.

Copper.—The Calumet & Hecla Consolidated Copper Co., Copper Range Co., and Quincy Mining Co. in Michigan, Bethlehem Steel Co. in Pennsylvania, Tennessee Copper Co. in Tennessee, and the Vermont Copper Co. in Vermont account for virtually all the copper produced in the States east of the Mississippi River. Total production in the region in 1950 was 40,105 short tons, a 22-percent increase over the 32,955 tons produced in 1949. Continuous operation of mines in Michigan, chiefly those of Calumet & Hecla Consolidated Copper Co., accounted for much of this increase. During 1949 the Calumet & Hecla Consolidated Copper Co. ceased most of its operations for a portion of the year owing to the relatively low price of copper. Output for Michigan increased 31 percent in 1950 over 1949. Output from Pennsylvania-Tennessee-Vermont increased 8 percent. The Copper Range Co. continued exploration and development of its White Pine ore body in Michigan. No labor strikes were reported in this portion of the metal-mining industry during the year. The annual weighted average price for copper was about 1.1 cents per pound higher in 1950 than in 1949.

Lead.—Lead is produced in the region chiefly as a byproduct or coproduct of the mining for zinc or fluorspar. Output in 1950 was

8,178 short tons, a 16-percent decrease from 1949. Most of the decrease can be attributed to a smaller output from fluorspar mines and closing of the Patrick mine in Southern Illinois by the Alco Lead Corp., which went out of business in the latter part of 1949. Zinc-lead mines in Wisconsin and Northern Illinois also recorded a decrease in production, and some output was lost owing to closing on May 15 of the Universal Exploration Co. Hyatt mine in New York. However, increased output from the St. Joseph Lead Co. Balmat mine offset the loss from the Hyatt mine, and the total output from New York State increased 13 percent. A labor strike at the Austinville mine of the New Jersey Zinc Co. from October 9 to November 23 resulted in a 2-percent decrease in the output of lead from Virginia mines. Lead was produced from mines in Illinois, Kentucky, New York, Virginia, and Wisconsin during 1950. In addition, exploration resulted in the production of a small quantity of lead ore from mines near Embreeville, Tenn.

Zinc.—Zinc produced from mines in the States east of the Mississippi River increased 12 percent in 1950 over 1949. Output in 1950 was 174,507 short tons and represented about 28 percent of the total United States output. In the region, zinc was produced from mines in Illinois, Kentucky, New Jersey, New York, Tennessee, Virginia, and Wisconsin. The principal producer was again the New Jersey Zinc Co., operating the Franklin and Sterling Hill mines in New Jersey and the Austinville mine in Virginia.

In Kentucky and Southern Illinois, zinc is produced chiefly as a byproduct or coproduct with fluorspar. The principal producers in this area were the Ozark-Mahoning Co. and the Minerva Oil Co. During the latter part of the year the Alcoa Mining Co. began producing and concentrating zinc ore from its newly developed Hutson mine in Kentucky. Output from the Kentucky-Southern Illinois area was 2 percent greater in 1950 than in 1949. New Jersey output was 8 percent greater than in 1949. The two producing mines—the Franklin and Sterling Hill—operated continuously after resumption of work when the strike at the Palmerton, Pa., zinc smelter ended January 26. New York mines produced about the same quantity of zinc as in 1949, in spite of the closing of the Hyatt mine of the Universal Exploration Co. on May 15. The other producers in New York during 1950 were the Balmat and the Edwards mines, operated by the St. Joseph Lead Co. Output of zinc from Tennessee mines increased 19 percent over 1949. This increase can be attributed to virtually continuous operation throughout the year by the leading producers and reopening of the Athletic mine in August by the American Zinc Co. of Tennessee. The leading producers were: The American Zinc Co. of Tennessee, operating the Athletic, Grasselli, Jarnagin, and Mascot No. 2 mines; the Universal Exploration Co.; and the Tennessee Copper Co. Production of zinc decreased 6 percent in Virginia, chiefly owing to a strike from October 9 to November 23 at the Austinville mine of the New Jersey Zinc Co. The Wisconsin and Northern Illinois area reported a 50-percent increase in output of zinc in 1950 over 1949. Most of this increase can be attributed to new operations of Calumet & Hecla Consolidated Copper Co. near Shullsburg, Wis., and the Eagle-Picher Mining & Smelting Co. near Galena, Ill. First shipments were made by these companies in September and April 1949, respectively. Other producers in the area include the Dodgeville Mining Co., Dodgeville, Wis. (operations resumed in July);

the Vinegar Hill Zinc Co., production at the new company mill and mine near Shullsburg, Wis., and at the Andrews mine, which began operation about December 10; and Tri-State Zinc, Inc., in Illinois. The Eagle-Picher Mining & Smelting Co. and the Vinegar Hill Zinc Co. accept custom ore at their mills.

MINING INDUSTRY

Again the base-metal mining industry experienced slumps in market demand and prices, followed by a period of strong demand with relatively high prices. In 1949 demand and prices for copper, lead, and zinc fell, causing closing of many small mines in the region and some curtailment of output or development at larger mines (most of the smaller mines did not resume operation in 1950). In 1950 shortages developed, and prices rose as the result of increased demand when consumers' stocks became low; this was followed by a stepped-up stockpiling program and then the Korean War, which added to national tension and demand. The Defense Production Act of 1950,[1] containing, among other things, provisions designed to stimulate mineral production, had little effect upon the industry before the year-end. (See Review of the Mineral Industries chapter of this volume and Copper, Lead, and Zinc chapters.)

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in States east of the Mississippi River in 1950, by class of ore in terms of recoverable metal

Class of ore [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Gold ore: Maryland	55	20				
Copper ore:						
Michigan	4,386,474			25,608		
Tennessee	1,088,653	160	39,958	[2] 14,497		(3)
Vermont	245,350	146	28,205	(2)		
Total	5,720,477	306	68,163	[2] 40,105		(3)
Magnetite-pyrite-chalcopyrite ore: Pennsylvania	1,954,144	1,764	10,563	(2)		
Zinc ore:						
Illinois	227,399				66	5,849
Kentucky	1,914					209
New Jersey	376,600					55,029
New York	119,200					10,500
Tennessee	1,165,981					[3] 35,267
Virginia	402					24
Wisconsin	28,567					639
Total	1,920,063				66	[3] 107,517
Zinc-lead ore:						
Illinois	528,601		2,001		2,661	21,133
Kentucky	49,727				66	522
New York	375,671		32,628		1,484	27,821
Tennessee	1,343				113	59
Virginia	426,030				3,254	12,372
Wisconsin	177,160				532	5,083
Total	1,558,532		34,629		8,110	66,990
Lead ore: Illinois	10				2	
Grand total: 1950	11,153,281	2,090	113,355	40,105	8,178	174,507
1949	9,624,995	1,940	101,612	32,955	9,755	156,298

[1] Includes old tailings.
[2] Data for copper in Pennsylvania (from magnetite-pyrite-chalcopyrite ore) and Vermont included with Tennessee in order to avoid disclosure of individual company operations.
[3] Zinc from Tennessee copper ore included with that from zinc ore in order to avoid disclosure of individual company operations.

[1] Public Law 774, 81st Cong., approved Sept 8, 1950.

METALLURGICAL INDUSTRY

Virtually all the ore and old tailings produced in the region were treated at concentration mills at or near the mines and then shipped to smelters, refineries, or oxide plants. Of the total of 11,153,281 short tons of material mined, 8,892,058 short tons were crude ore treated initially at a concentration mill, 44 tons were crude ore shipped direct to a smelter, and 2,261,179 tons were old tailings treated initially at tailings' reclamation plants. The ore tonnage includes 1,954,144 tons of magnetite-pyrite-chalcopyrite ore produced in Pennsylvania, which has not been included in reporting for years before 1949. This tonnage of Pennsylvania ore is also reported in the Iron Ore chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in States east of the Mississippi River, in 1950, by States, in terms of recoverable metal

State[1]	Mines producing		Ore and tailings (short tons)	Gold			Silver (all lode)	
	Lode	Placer		Fine ounces: Lode	Fine ounces: Placer	Total value	Fine ounces	Value
Illinois	17		[2] 756,010				2,001	$1,811
Kentucky	7		[2] 51,641					
Maryland	1		55	20		$700		
Michigan	9		4,386,474					
New Jersey	2		376,600					
New York	3		494,871				32,628	29,530
Pennsylvania	1		1,954,144	1,764		61,740	10,563	9,560
Tennessee	12		2,255,977	160		5,600	39,958	36,164
Vermont	1		245,350	146		5,110	28,205	25,527
Virginia	2		426,432					
Wisconsin	11		205,727					
Total: 1950	66		11,153,281	2,090		73,150	113,355	102,592
1949	119	2	9,624,995	1,940	27	68,845	101,612	91,964

State[1]	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Illinois			2,729	$736,830	26,982	$7,662,888	$8,401,529
Kentucky			66	17,820	731	207,604	225,424
Maryland							700
Michigan	25,608	$10,652,928					10,652,928
New Jersey					55,029	[3] 17,258,637	[3] 17,258,637
New York			1,484	400,680	38,321	10,883,164	11,313,374
Pennsylvania	(4)	(4)					[4] 71,300
Tennessee	[4] 14,497	[4] 6,030,752	113	30,510	35,326	10,032,584	[4] 16,135,610
Vermont	(4)	(4)					[4] 30,637
Virginia			3,254	878,580	12,396	3,520,464	4,399,044
Wisconsin			532	143,640	5,722	1,625,048	1,768,688
Total: 1950	40,105	16,683,680	8,178	2,208,060	174,507	51,190,389	70,257,871
1949	32,955	12,984,270	9,755	3,082,580	156,298	40,560,934	56,788,593

[1] Total for 1949 includes 18 ounces of gold ($630) from Georgia and 13 ounces of gold ($455) from North Carolina; no production in Georgia or North Carolina in 1950.
[2] Excludes lead-bearing material mined with fluorspar and from which some lead was recovered as a byproduct of the mining and milling of the fluorspar.
[3] Estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges are added.
[4] Data for copper in Pennsylvania and Vermont included with Tennessee in order to avoid disclosure of individual company operations.

The methods of treatment used in the mills and other operating details, including the tonnage and grade of concentrates produced at some mills, are given in the Review by States that follows. About 55 tons of gold ore were treated by amalgamation in 1950.

Active smelters and refineries in States east of the Mississippi River that treated primary materials include copper plants at Hubbell and Hancock, Mich., Carteret, N. J., Laurel Hill, N. Y., Copperhill, Tenn., Baltimore, Md., and Barber, N. J.; lead plants at Barber, N. J., East Chicago, Ind., and Federal Hill, Ill.; zinc plants at Hillsboro, Fairmont City, La Salle, East St. Louis, and Depue, Ill., Donora, Palmerton, and Josephtown, Pa., Columbus, Ohio, and Meadowbrook, W. Va.

REVIEW BY STATES

ILLINOIS

Zinc and lead production from the State in 1950 was, in terms of recoverable metal, 26,982 and 2,729 short tons, respectively, a 49-percent increase in output of zinc over 1949, but a 29-percent decrease in lead. The output of silver, in terms of recoverable metal, all from Southern Illinois mines, was 2,001 fine ounces, a 36-percent decrease from the previous year.

Northern Illinois.—All production of lead and zinc in Northern Illinois in 1950 was from mines in Jo Daviess County. Output was from five mines, three operated by Tri-State Zinc, Inc., and two by the Eagle-Picher Mining & Smelting Co. Total production from these mines was 574,650 tons of ore, from which 1,819 tons of lead concentrates and 38,463 tons of zinc concentrates were made, containing, in terms of recoverable metal, 1,269 tons of lead and 21,071 tons of zinc.

Tri-State Zinc, Inc., operated the Bautsch, Black Jack, and Heer mines, hauling ore from them to the company's adjacent beneficiation plant (Gray Mill) by truck. The Bautsch and Black Jack mines both have inclined adit tunnels leading to the mine through which trucks are driven directly from the mill to stopes in the mine. At the Heer mine ore is hoisted to the surface through a 278-foot shaft. These mines are in R. 1 E., T. 27 N. The Black Jack mine is in sec. 4 and the Bautsch and Heer in sec. 10. The Bautsch mine was operated throughout 1950, whereas the Black Jack was operated part time after completion of the inclined adit in March. The Heer was operated during May, June, and July. Development work by the company included 1,020 feet of churn drilling at the Black Jack. No development was reported for the other two mines.

The Eagle-Picher Mining & Smelting Co. operated the Graham and Snyder mines and its Graham central mill, a few miles north of Galena, Ill., continuously throughout the year. The mines are in secs. 25 and 32, R. 1 E., T. 29 N. Custom ore was accepted at the mill, virtually all from mines in Wisconsin. Development at the company's mines included 2,030 feet of drift. Rated capacity of the mill in 1950 was 1,800 tons in 24 hours.

Southern Illinois.—Production of zinc, lead, and silver was reported from only 12 mines in Southern Illinois in 1950 compared with 23 in 1949. Output of silver and lead in terms of recoverable metal decreased 36 and 45 percent, respectively, whereas production of zinc increased 5 percent over 1949. The decreased output of silver and lead was chiefly due to cessation of operations at the Patrick mine of the Alco Lead Corp. in the latter part of 1949. Virtually all of the silver, lead, and zinc produced in the district was a byproduct or coproduct of fluorspar mining.

The Ozark-Mahoning Co. operated several mines and its all-flotation custom mill at Rosiclare and was the largest producer of all three metals in the district. The company mill was operated continuously throughout the year, and the mines operated almost continuously. Development at its Illinois mines included 428 feet of shaft, 450 feet of drifts, 514 feet of diamond drilling, and 13,952 feet of churn drilling. A shaft was sunk at the Mahoning mine during the year.

Minerva Oil Co. was the second-largest producer of zinc in Southern Illinois in 1950. The company operated its fluorspar-zinc mine and mill continuously, except for the period of a labor strike June 1–19. Several improvements were made at the mine and mill during the year, including a new drill jumbo, replacement of principal pumps in the mine, a new and larger crusher, addition of six flotation cells, a new and larger steel ore bin, and the addition of two capacitors to raise the power factor.

Other producers of zinc or lead in the district included The Rosiclare Lead & Fluorspar Co., Alcoa Mining Co., Crystal Fluorspar Mining Co., and three very small producers.

KENTUCKY

Zinc or lead was produced chiefly as a byproduct or coproduct with fluorspar from seven mines in Kentucky during 1950. Total output of recoverable zinc and lead was 731 and 66 short tons, respectively.

The Ozark-Mahoning Co., operating the Babb and Commodore mines, was the State's largest producer of both metals. The Commodore mine was operated for 10 months of 1950 and the Babb mine 6 months. Development at these mines during the year included 160 feet of shaft and winze and 312 feet of diamond drilling. A report of investigation of the Babb vein system, made in 1943–44 by the Bureau of Mines, was published.[2]

Initial production of concentrates from the Hutson mine of the Alcoa Mining Co. in Livingston County took place in October 1950. The ore is zinc sulfide with a high percentage of iron sulfide. Upper-level ore contains considerable zinc carbonate. This deposit is unique in the district in that there is virtually no lead sulfide or calcium fluoride (fluorspar). Ore is beneficiated at the company's new Hutson flotation mill on Sandy Creek about 5 miles southwest of Salem, Ky. Mill capacity is 100 tons per 24 hours. The mine is operated through two shafts, one 525 and one 200 feet deep. Other producers of zinc or lead in the State include the United States Coal & Coke Co., operating the Tabb No. 1 mine, and three other operators who produced very small quantities of lead or zinc.

MARYLAND

In Maryland one lode-gold mine was operated intermittently by E. T. and Huntley Ingalls in Montgomery County as a prospecting

[2] Swanson, A. S., and Starnes, X. R., Investigation of Fluorite deposits of Babb Vein System, Crittenden and Livingston Counties, Ky.: Bureau of Mines Rept. of Investigations 4677, 1950, 30 pp.

venture during 1949 and 1950. A total of 20 fine ounces of gold was produced during this period, all of which has been credited as 1950 output.

MICHIGAN

Continuous operation of Michigan copper mines and tailings-reclamation plants at a relatively steady production rate resulted in the output of 25,608 short tons of copper from the State in 1950. This is a 31-percent increase over the 1949 output. Three companies operated nine mines and three tailings-reclamation plants.

Of the three companies, Calumet & Hecla Consolidated Copper Co. was the largest producer. The company operated eight mines and two tailings-reclamation plants. Ore from the mines was beneficiated at the Ahmeek mill, and the tailings were treated at the Tamarack and the Lake Linden reclamation plants. Mill operations were conducted on a three-shift, 7-day-week basis. Extracts from the Calumet & Hecla annual report follows:

The Company's copper mines and reclamation plants operated at capacity throughout 1950, although high prices of scrap copper caused some curtailment of smelter output in the second half of the year. The improvement in production figures in 1950 over 1949 was marked. * * *

* * * Material treated was of a somewhat lower grade than previously, but the copper price in 1950 was high enough to make a satisfactory profit. Our smelter and refinery operations continued at a high level through most of the year. However, during the last few months of 1950 the abnormally high prices being charged for suitable copper scrap made it undesirable for us to process scrap for our own account. We did continue to refine scrap on toll for our customers until December when the Government prohibited this type of transaction.

Processing of scrap copper into copper chemicals and oxide was expanded in 1950 as demand increased, particularly for agricultural oxides.

A new power plant which was put into operation late in 1949 has performed satisfactorily and resulted in a considerable reduction of costs.

* * * * * * *

EXPLORATION

Exploration for copper and zinc ores and underground development work, cut back in 1949, was expanded during 1950. In northern Michigan mechanized equipment was used for removing overburden and uncovering bedrock. This relatively new method is believed to be more effective under conditions present in Northern Michigan than the older method of diamond drilling and will be resumed in the spring of 1951.

* * * * * * *

RESEARCH AND DEVELOPMENT

The program of research and development at Calumet has been enlarged and intensified. In order to effect cost reduction, study is being directed constantly to improving methods. The development of new processes and products is proceeding vigorously with promising results.

The Quincy Mining Co., second-largest producer in the State, continued treatment of tailings at its reclamation plant at Mason, Mich. Concentrates made were shipped to the company smelter at Hancock, Mich.

Copper Range Co. was third in rank with respect to production. Extracts from its annual report for 1950 follow:

Mining was carried on throughout the year in the East Vein of the Champion Mine. Changes in the price of copper during the year were reflected in the amount and scope of our development work and mining. By midyear it was decided that the collateral advantages to the Company in continuing to operate the mine, in addition to having a firm although small source of copper, justified increasing development and mining to a rate which would compensate for the curtailment of this work in the preceding twelve months. It has been planned, under the conditions of the present emergency, to gradually increase the tonnage up to the capacity of our mining plant. During the year 196,566 tons of ore were shipped to the Mill at Freda * * *. The results of development work and mining have continued to show the ore as barely marginal under the existing conditions. At the end of the year approximately 101,000 tons of broken ore were held in reserves in the shrinkage stopes. Wage increases made during the year, coupled with increases in the cost of material and supplies, resulted in a substantial increase in the cost of production.

The Mill at Freda operated throughout the year. The improvements made in the crushing and grinding circuit in late 1949 continued to operate satisfactorily and these and other improvements prevented the full impact of increases in labor and other costs from being reflected in our final results. The Freda reclamation plant was not operated in 1950 due to a lack of available stamp sands of satisfactory grade. These sands are not replacing themselves as rapidly as in former years and it is possible that this source of copper has been exhausted. No further plans were made to treat the stamp sands at Redridge and at Gay.

The Douglass property under lease to the Calumet and Hecla Consolidated Copper Company produced 8,109,962 pounds of copper in 1950 as compared with 4,755,052 pounds in the preceding year. Production came from the Kearsage Lode and the Houghton Conglomerate. Exploration and development work was continued in the Houghton Conglomerate area with favorable results.

The exploration program of the White Pine ore body by diamond drilling, started in May 1949, was completed in December 1950. Six holes were completed this year to total 9,516 feet. This work has added a substantial tonnage of ore to our reserves. The year-end estimate of 309,660,000 tons averaging 21.3 pounds of copper per ton in the total ore column, including 154,320,000 tons of ore averaging 24.3 pounds of copper per ton in the Parting Shale, can undoubtedly be greatly increased by further exploration.

Mining operations consisted of keeping the shaft unwatered and mining 2,700 tons of ore for the pilot mill at Freda and for testing and other experimental purposes. Stoping was carried on in two places in the mine in order to secure as representative an ore as possible.

Research on milling was continued in the laboratory throughout the first four months of the year, resulting in important improvements in the metallurgy. A pilot mill with a nominal capacity of ten tons per day was put in operation in May and has confirmed the laboratory work as well as developing some phases of the metallurgy and flow sheet that could not be effectively explored or determined in the laboratory. As a result of the testing and comprehensive research, a relatively simple flow sheet has been designed for the concentration of the ore to produce a concentrate carrying at least 25% copper and containing 85% of the total copper from ore, assaying about 24 pounds of copper per ton. Moderate variations in the grade of ore should not materially affect the over-all results anticipated in actual plant operation. The results of recent pilot mill tests have indicated further improvements in the metallurgy that promise better recovery and the lowering of our preliminary estimates of construction, equipment and operating costs.

In September the pilot leaching plant which covers the complete processes of roasting the concentrates in a Fluo-Solids reactor, agitation leaching, and electrolytic deposition of the copper from solution was completed and placed in operation by the engineers of the Dorr Company. Results of significant importance have been obtained and further studies and tests are being made. The investigation of whether the copper in the concentrates should be extracted by smelting and fire refining or by leaching and electrolytic deposition is being continued. The completion of these tests and research now being undertaken should give us sufficient additional information to resolve this important problem.

NEW JERSEY

Production and value of zinc produced from mines in New Jersey increased 8 and 19 percent, respectively, in 1950 over 1949. Output in 1950, in terms of recoverable content, was 55,029 short tons valued at $17,258,637, slightly less than half was refined to zinc metal and the remainder processed to zinc oxide. Mines producing were the Franklin and Sterling Hill in Sussex County. These mines were idle due to a strike at the Palmerton, Pa., smelter from September 27, 1949, to January 26, 1950. Mine operation was resumed January 30, 1950.

The value of the New Jersey output of zinc given in the tables of this chapter is the combined value of the zinc recoverable as metal or as oxide after freight, haulage, smelting, and manufacturing charges have been added.

NEW YORK

Production of silver, lead, and zinc from mines in New York was greater by 78, 13, and 1 percent, respectively, in 1950 over 1949. This increase was recorded, even though the Hyatt mine was permanently closed May 15. The Universal Exploration Co. began developing the Hyatt mine in 1938. First production of lead and of zinc concentrates was recorded from its new 200-ton-per-day flotation mill early in 1941. Production continued relatively steady until cessation of operations May 15, 1950.

The St. Joseph Lead Co. continued operation of its Balmat and Edwards mines throughout 1950. Lead and zinc are produced from the Balmat mine. A program to increase the daily capacity of the mill at the Balmat from 1,200 tons to 1,800 tons was initiated during the year. Development at the mine included 217 feet of shaft, 8,776 feet of drifts, and 44,590 feet of diamond drilling. The Edwards mine produces only zinc. Ore is treated in a 600-ton-per-day flotation plant. Development at this mine included 6,570 feet of drifts and 6,776 feet of diamond drilling.

Silver is carried in small quantities in the lead concentrates from both the Balmat and the Hyatt mine. Its recovery at the smelter depends greatly on the demand for desilverized lead. A larger percentage recovery of silver at the lead smelter in 1950 accounts for most of the increase in the State's silver output.

A report on an investigation of the Shawangunk mine in Sullivan County during 1948–49 was published.[3]

PENNSYLVANIA

Gold, silver, and copper were produced along with iron from the Cornwall mine by the Bethlehem Steel Co. No lead or zinc mining was reported in the State. However, the New Jersey Zinc Co. continued to develop its zinc mine near Friedensville.

Production in 1950 from the Cornwall mine, the only producer, showed a 27-percent increase in tonnage of magnetite-pyrite-chalcopyrite ore mined, but the output of gold increased only 7 percent and copper 4 percent, whereas silver production decreased 2 percent. This property is operated both as an open pit and underground mine. The ore is treated first in a 6,000-ton-per-day magnetic separation plant. The tailings then go to a 2,200-ton flotation plant and the magnetic product to a 2,400-ton sintering plant. The mill was operated three shifts per day 6 days a week in 1950. Operation was on a 5-day schedule in 1949.

Zinc smelters at Donora, Josephtown, and Palmerton, Pa., treat most of the zinc concentrates produced in New York, Tennessee, and Virginia, as well as large tonnages from other States and from foreign

[3] Eilertsen, N. A., Investigation of Shawangunk Mine, Zinc-Lead Deposit, Near Summitville, Sullivan County, N. Y.: Bureau of Mines Rept. of Investigations 4675, 1950, 41 pp.

countries. The smelter at Palmerton was idle due to a strike from September 26, 1949 to January 26, 1950.

Reports on investigations of the Perkiomen Creek copper deposits, the New Galena lead deposits and the Almedia lead-zinc deposit were published by the Bureau of Mines.[4]

TENNESSEE

Copper and zinc production from mines in Tennessee increased 6 and 19 precent, respectively, in 1950 over 1949. Gold, silver, and lead output decreased 6, 4, and 56 percent, respectively. Production was again reported by 5 companies from 12 mines. The total tonnage of ore produced in 1950 was greater than 1949 by 4 percent and explains the increases in copper and zinc produced. Gold and silver are byproducts of copper-zinc mining in Tennessee. These metals are virtually unassayable in the original ore. They are allowed to accumulate in the copper smelter and the copper sulfate circuit, usually for several months, until there is enough to warrant casting "high-gold-silver-copper" anodes for shipment to an electrolytic refinery. Because of the practice of allowing gold and silver to accumulate for several months, the monthly and annual mine-production rates of these two metals are estimated. Lead was produced in 1949 and 1950 as a result of prospecting and exploration performed near Embreeville, Washington County, and not from regular mining; consequently, the decreased output is not significant.

The American Zinc Co. of Tennessee operated the Grasselli, Jarnagin, and Athletic (Mossy Creek) mines in Jefferson County and the Mascot No. 2 mine in Knox County. Operations at the Athletic, shut down June 17, 1949, were resumed in August 1950, and the other mines were operated throughout the year. All ore is beneficiated at the company mill at Mascot. During the latter part of 1950 custom ore from the Timberville mine in Virginia and from the Universal Exploration Co. in Tennessee was also treated. Concentrates from this mill were shipped to eight different smelters or oxide plants. Development at the American Zinc Co. of Tennessee mines included 2,332 feet of drift and 25,921 feet of diamond drilling at the Mascot No. 2; 447 feet of drift at the Jarnagin; 1,763 feet of drift, 2,295 feet of diamond drilling, and 15,006 feet of churn drilling at the Grasselli; and 191 feet of drift at the Athletic.

The Tennessee Copper Co. operated the Burra Burra, Calloway, Mary, Eureka, and Boyd mines throughout 1950. Development during the year included 750 feet of shaft, 13,912 feet of drifts, 4,367 feet of raises, and 12,580 feet of diamond drilling. Ore is initially beneficiated at the company London and Isabella mills, which have a total daily capacity of about 3,200 tons. The products are zinc concentrates, copper concentrates, iron concentrates, and limestone tailings. Zinc concentrates were sent to smelters or oxide plants for further refining. Copper concentrates were converted to blister copper in the company 150-ton reverberatory furnace and cast chiefly as shot copper for the manufacture of copper sulfate.

[4] Earl, Kenneth M., Investigation of Perkiomen Creek Copper Deposits, Montgomery County, Pa.: Bureau of Mines Rept. of Investigations 4666, 1950, 13 pp. Investigation of New Galena Lead Deposit, Bucks County, Pa.: Bureau of Mines Rept. of Investigations 4703, 1950, 7 pp. Investigation of the Almedia Lead-Zinc Deposit, Columbia County, Pa.: Bureau of Mines Rept. of Investigations 4743, 1950, 9 pp.

In Jefferson County the Universal Exploration Co. continued to operate the Davis-Bible group of mines and its 800-ton-per-day flotation mill. Mine development included 15 feet of shaft, 2,201 feet of drifts, 2,447 feet of diamond drilling, and 2,231 feet of churn drilling. Most of the ore was treated at the company mill, but during the latter part of the year some ore was sent to the Mascot mill of the American Zinc Co. of Tennessee.

A small quantity of lead ore and zinc-lead ore was shipped to smelters from mines in Washington County.

The Bureau of Mines published a report on an investigation of the Brown-Tipton zinc deposit, Green County, made in 1944.[5]

VERMONT

The Vermont Copper Co. continued to operate the Elizabeth mine in Orange County. There was also small production from adjacent mine dumps. This company was the only producer of gold, silver, and copper in the State in 1950. Output of these three metals was greater by 22, 3, and 17 percent, respectively, than in 1949. The ore, containing chalcopyrite and pyrrhotite with a small quantity of gold and silver, was concentrated in the company 500-ton flotation mill. Concentrates are shipped to the Phelps-Dodge Corp. smelter and refinery at Laurel Hill, N. Y.

VIRGINIA

Production of zinc and lead from mines in Virginia was 6 and 2 percent less, respectively, in 1950 than in 1949, chiefly as the result of a strike at the Austinville mine of the New Jersey Zinc Co. from October 9 to November 23. This mine had been operated continuously during 1949. No copper, gold, or silver production was recorded during the year. The Austinville mine is in Wythe County. Ore is treated at the company 2,000-ton-per-day mill at the mine. Zinc concentrates were sent to the zinc smelters at Palmerton, Pa., and Hillsboro, Ill. Lead concentrates were shipped to the lead smelter at Federal, Ill. A small quantity of ore was shipped by the Timberville Mining Co., Frederick County, for concentration at the Mascot mill of the American Zinc Co. of Tennessee.

WISCONSIN

Although the number of producing mines in Wisconsin decreased from 46 in 1949 to 11 in 1950, the output of recoverable zinc increased from 5,295 to 5,722 tons. Producers not operating in 1950 were chiefly individuals who worked intermittently, several producing only high-grade lead concentrates from surface or near surface operations. These operators ceased mining because the price of lead and zinc dropped in 1949. Loss of this output was the chief reason for the decreased production of lead from 857 tons in 1949 to 532 tons in 1950. Continuous operation of the new mine and mill of the Calumet & Hecla Consolidated Copper Co. near Shullsburg (first production reported in September 1949) accounted for much of the State's zinc output. This company has a 1,200-ton-per-day mill at the mine. It was operated on a three-shift, 6-day-week basis. Concentration is

[5] Warner, A. H., Investigation of the Brown-Tipton Zinc Deposit, Green County, Tenn.: Bureau of Mines Rept. of Investigations 4645, 1950, 6 pp.

by jigs and flotation. Both zinc and lead concentrates are made. Development in the mine included 1,316 feet of drifts and 44,775 feet of churn drilling. In advancing a drift to open a new section of the mine to the south, considerable water, as expected, was encountered and caused curtailed production during October and November. Extracts from the Calumet & Hecla annual report follow:

The Company's zinc-lead mine at Shullsburg, Wisconsin, at the end of 1950 passed from an exploratory to what is expected to be a profitable operating basis. Fractured and folded rock formations retarded and hampered mining operations. An abnormally large flow of water required the installation of pumping capacity sufficient to handle 14,400 gallons per minute, which is believed to be ample to cope with any foreseeable future needs. The mine is operated through modern and efficient techniques, using diesel trucks and the latest mechanical equipment for loading and transporting ore. Substantial reserves assure many years of operation. A basis for profitable operations was achieved by the end of 1950.

* * * * * * *

In the Wisconsin zinc area, churn drilling was conducted to extend and outline the several ore bodies under development, and to explore the block of land under lease. Results have been encouraging. * * *

The Vinegar Hill Zinc Co. developed the Blackstone mine and built a new mill south of Shullsburg. The mill is rated at 600 tons per day. Production from this mine and operation of the new "Hancock" mill were begun in December.

The Cuba Mining Co., a subsidiary of Vinegar Hill Zinc Co., reopened the Andrews mine and shipped ore to the new mill. Custom ore from the Little Mullen and De Rocher mines was also accepted at the mill.

On July 20 the Dodgeville Mining Co., Iowa County, resumed operation of its mill and began to mine ore from the Dodgeville No. 3 mine. The mill has jigs and a 50-ton flotation plant. A new waste-disposal unit was added to the mill during the year.

Other operators producing in 1950 include the H. B. & H. Mining Co., Benton Milling Co., L. G. & W. Mining Co., Chestnut Hill Zinc Co., Little Grant Mining Co., Fred Hofer & Sons, and Whitechurch & Farr.

A report was published of an investigation of the White zinc-lead deposit, Lafayette County, by the Bureau of Mines in 1947.[6]

OTHER STATES

No production of gold, silver, copper, lead, or zinc was reported in other States in the region during 1950. The Bureau of Mines published reports of investigation on mines in Georgia, Maine, and New Hampshire.[7]

---

[6] Grosh, W. A., Investigation of the White Zinc-Lead Deposit, Lafayette County, Wis.: Bureau of Mines Rept. of Investigations 4722, 1950, 5 pp.

[7] Peyton, Alexander L., and Cofer, Harland E., Jr., Magruder and Chambers Copper Deposits, Lincoln and Wilkes Counties, Ga.: Bureau of Mines Rept. of Investigations 4665, 1950, 23 pp.

Earl, Kenneth M., Investigation of the Tapley Copper Deposit, Hancock County, Maine: Bureau of Mines Rept. of Investigations 4691, 1950, 7 pp. Investigation of the Douglas Copper Deposit, Hancock County, Maine: Bureau of Mines Rept. of Investigations 4701, 1950, 17 pp. Investigation of Milan Copper Deposit, Coos County, N. H.: Bureau of Mines Rept. of Investigations 4718, 1950, 9 pp.

Idaho

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Almon F. Robertson and Virginia Halverson

GENERAL SUMMARY

OUTPUT of all major nonferrous metals increased in Idaho in 1950. Gold output increased from 77,829 fine ounces in 1949 to 79,652 in 1950 (2 percent); silver from 10,049,257 fine ounces to 16,095,019 (60 percent); copper from 1,438 short tons to 2,107 (47 percent); lead from 79,299 tons to 100,025 (26 percent); and zinc from 76,555 tons to 87,890 (15 percent).

The lead output exceeded the zinc output by 14 percent compared with 4 percent in 1949. The total value of the five metals increased from $56,429,796 in 1949 to $70,198,647 in 1950, or 24 percent. Gold was valued at $2,787,820 or 4 percent of the State total; silver, $14,566,805 (21 percent); copper, $876,512 (1 percent); lead, $27,006,-750 (38 percent); and zinc $24,960,760 (36 percent). In 1950 Idaho remained the largest producer of silver and zinc in the United States and the second-largest producer of lead (exceeded only by Missouri). About 94 percent of the State silver production, 90 percent of the copper, 95 percent of the lead, and 98 percent of the zinc came from the Coeur d'Alene region of Shoshone County; the remaining silver, copper, lead, and zinc came largely from the Warm Springs district in Blaine County.

About 61 percent of the State gold production in 1950 came from a lode mine in the Yellow Pine district, Valley County; the remainder came largely from dredging operations in the Elk City district, Idaho County; Boise Basin district, Boise County; Yankee Fork district, Custer County; and Ten Mile district, Idaho County.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. The value of metal production has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946: $0.71111111; July 1, 1946, to Dec. 31, 1947: $0.905; 1948–50: $0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Idaho, 1946–50, and total, 1863–1950, in terms of recoverabe metal [1]

Year	Lode mines		Placer mines		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	139	2,882,187	71	4,178,023	42,975	$1,504,125	6,491,104	$5,244,812
1947	183	3,717,697	99	4,467,931	64,982	2,274,370	10,345,779	9,362,930
1948	194	3,981,846	78	4,042,245	58,454	2,045,890	11,448,875	10,361,810
1949	171	3,057,075	82	3,046,837	77,829	2,724,015	10,049,257	9,095,085
1950	155	3,300,215	75	2,560,730	79,652	2,787,820	16,095,019	14,566,805
1863–1950	----------	(2)	----------	(2)	8,121,666	187,397,713	568,424,342	402,418,623

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	1,038	$336,312	59,987	$13,077,166	71,507	$17,447,708	$37,610,123
1947	1,640	688,800	78,944	22,735,872	83,069	20,102,698	55,164,670
1948	1,624	704,816	88,544	31,698,752	86,267	22,947,022	67,758,290
1949	1,438	566,572	79,299	25,058,484	76,555	18,985,640	56,429,796
1950	2,107	876,512	100,025	27,006,750	87,890	24,960,760	70,198,647
1863–1950	114,596	35,793,779	6,287,196	762,378,126	1,627,453	298,224,745	1,686,212,986

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore and old tailings shipped directly to smelters during the calendar year indicated.
[2] Figure not available.

Gold.—The output of recoverable gold in Idaho in 1950 was 79,652 ounces, 1,823 ounces over 1949. This entire gain was from placer mines, as the output of gold from lode properties decreased 660 ounces. Gold from lode mines in 1950 was 62,091 fine ounces compared with 62,751 fine ounces in 1949, and that from placer properties was 17,561 fine ounces compared with 15,078. The Yellow Pine lode mine in Valley County, worked by the Bradley Mining Co., continued to be the largest producer of gold in Idaho; it was followed by a lode property at Atlanta worked by Talache Mines, Inc.; a bucket-line dredge at Idaho City worked by the Idaho-Canadian Dredging Co.; a bucket-line dredge at Elk City worked by the Warren Dredging Corp., and a bucket-line dredge at Elk City worked by H. & H. Mines, Inc. Of the total gold produced in Idaho in 1950, nearly 70 percent came from gold ore, 17 percent from bucket-line dredging, 4 percent from dragline dredging (including operations of nonfloating washing plants), and most of the remainder from zinc-lead ore. Four bucket-line dredges and 11 nonfloating washing plants and dragline dredges treated about 2,500,000 cubic yards of gravel in 1950 and recovered 17,072 fine ounces of gold and 5,187 fine ounces of silver.

Silver.—Idaho's output of recoverable silver in 1950 was 16,095,019 ounces, 6,045,762 more than in 1949. The State continued to be the largest producer of silver in the United States—a place it has held since 1933. The Coeur d'Alene region produced 15,056,131 fine ounces of silver in 1950, or 94 percent of the State total; the remainder came largely from the Warm Springs, Bayhorse, and Yellow Pine districts. Of the State total silver, silver ore yielded 60 percent, zinc-lead ore and old tailings 34 percent, lead ore 5 percent, and gold ore most of the remainder. Recovery of silver from silver ore increased 5,470,467 ounces, that from zinc-lead ore 1,207,840 ounces, and that from gold ore 66,265 ounces. However, recovery of silver from lead ore decreased 744,150 ounces.

TABLE 3.—Gold produced at placer mines in Idaho, 1946–50, by classes of mines and by methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucket-line dredges:					
1946	7	3,766,746	17,448	$610,680	$0.162
1947	8	3,381,351	14,112	493,920	.146
1948	5	3,139,168	14,969	523,915	.167
1949	4	2,332,576	10,234	358,190	.154
1950	4	2,005,000	13,549	474,215	.237
Dragline dredges:					
1946	6	364,260	2,272	79,520	.218
1947	4	577,000	2,939	102,865	.178
1948	2	400,000	1,071	37,485	.094
1949	2	406,000	1,409	49,315	.121
1950	2	296,000	1,839	64,365	.217
Suction dredges:					
1946	-	-	-	-	-
1947	5	19,590	103	3,605	.184
1948	3	1,200	20	700	.583
1949	2	11,765	54	1,890	.161
1950	1	500	15	525	1.050
Nonfloating washing plants: [1]					
1946	-	-	-	-	-
1947	8	444,490	2,232	78,120	.176
1948	5	457,570	4,204	147,140	.322
1949	5	259,500	3,064	107,240	.413
1950	9	205,117	1,684	58,940	.287
Gravel hydraulically handled:					
Hydraulic:					
1946	10	37,100	248	8,680	.234
1947	9	32,560	152	5,320	.16
1948	4	32,600	189	6,615	.203
1949	5	14,800	87	3,045	.206
1950	10	37,085	292	10,220	.276
Small-scale hand methods: [2]					
1946	43	7,350	133	4,655	.633
1947	58	10,607	218	7,630	.719
1948	54	11,087	307	10,745	.969
1949	60	20,866	218	7,630	.366
1950	49	17,028	182	6,370	.374
Underground placers (drift):					
1946	5	2,567	22	770	.300
1947	7	2,333	20	700	.300
1948	5	620	16	560	.903
1949	3	1,330	12	420	.316
1950	-	-	-	-	-
Grand total placers:					
1946	71	4,178,023	20,123	704,305	.169
1947	99	4,467,931	19,776	692,160	.155
1948	78	4,042,245	20,776	727,160	.180
1949	[3] 82	3,046,837	15,078	527,730	.173
1950	75	2,560,730	17,561	614,635	.240

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."
[2] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Idaho.
[3] A mine using more than 1 method of recovery is counted but once in arriving at total for all methods.

Twelve mines—the Sunshine, Bunker Hill & Sullivan, Polaris, Silver Summit, Silver Dollar, Page, Triumph, Silver Syndicate, Sherman, Star, Dayrock, and Morning—produced 88 percent of the silver output of the State in 1950. Six properties (Sunshine, Polaris, Silver Dollar, Silver Syndicate, Sunshine Consolidated, and Metropolitan) near Kellogg, operated by the Sunshine Mining Co., in 1950 produced 8,293,869 ounces of silver, or 52 percent of the State total.

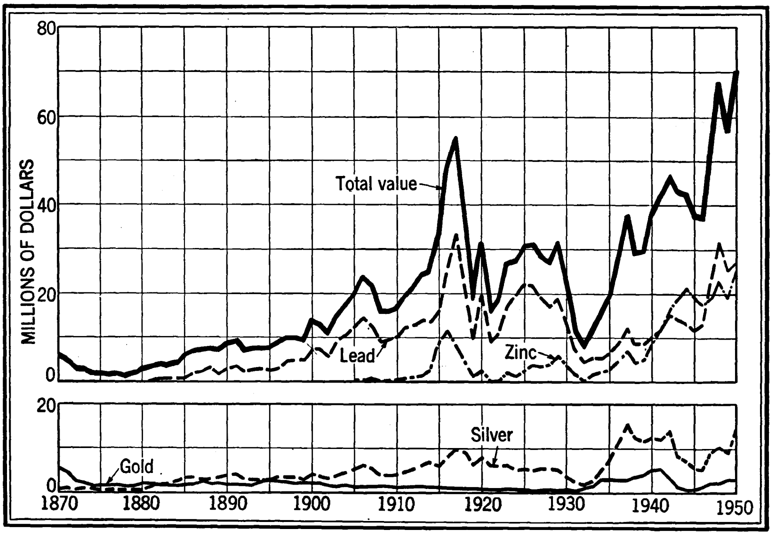

FIGURE 1.—Value of mine production of gold, silver, lead, and zinc, and total value of gold, silver, copper, lead, and zinc in Idaho, 1870–1950. The value of copper has been less than $2,000,000 annually, except in a few years.

Copper.—The output of copper in Idaho increased to 2,107 tons in 1950, 669 tons more than in 1949. About 88 percent of the State copper output in 1950 was recovered as a byproduct in the treatment of zinc-lead ore and silver ore from mines in the Coeur d'Alene region; the remainder was recovered largely from zinc-lead ore produced in the Warm Springs district.

The Sunshine mine near Kellogg in the Coeur d'Alene region continued to be the largest producer of copper in Idaho. It was followed by the Bunker Hill & Sullivan, Polaris, Triumph, and Silver Dollar properties.

Lead.—In 1950 Idaho mines produced 100,025 tons of recoverable lead, 20,726 tons more than in 1949. In 1950, 95 percent of the State total lead came from the Coeur d'Alene region; most of the remainder was produced in the Warm Springs, Bayhorse, Texas, Port Hill, and Clark Fork districts. Zinc-lead ore and old tailings (1,989,821 tons) from the Coeur d'Alene region yielded 78 percent of the State total lead; and lead ore and silver ore, chiefly from the Coeur d'Alene region, yielded 17 percent. The remainder came largely from zinc-lead ore in the Warm Springs and Bayhorse districts, lead ore in the Bayhorse, Texas, Port Hill, Clark Fork, and Alder Creek districts, and old zinc slag in the Coeur d'Alene region. Lead recovered from zinc-lead ore and old tailings increased 35,872,985 pounds, that from silver ore 5,602,925 pounds, and that from zinc ore and lead-smelter slag 1,126,637 pounds; however, the lead recovered from lead ore decreased 1,165,139 pounds.

The Bunker Hill & Sullivan mine at Kellogg was by far the largest producer of lead in Idaho in 1950. The combined lead output of the seven largest producing mines (each producing more than 7,000,000 pounds)—the Bunker Hill & Sullivan, Page, Star, Morning, Sherman, Dayrock, and Sidney—was 139,306,500 pounds or 70 percent of the State total. Other important producers in 1950 were the Frisco,

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Ada		1	6	$210		
Blaine	14		1,931	67,585	519,497	$470,171
Boise	11	18	5,046	176,610	2,245	2,032
Bonner	8		194	6,790	69,953	63,311
Boundary	2		56	1,960	6,161	5,576
Butte	1				116	105
Camas	1		139	4,865	673	609
Cassia	2		259	9,065	73	66
Clark	2		1	35	274	248
Clearwater		2	5	175		
Custer	15	6	3,195	111,825	173,092	156,657
Elmore	6	3	5,455	190,925	36,809	33,314
Gem	2		595	20,825	1,200	1,086
Idaho	10	24	9,845	344,575	1,758	1,591
Jerome		2	3	105		
Latah		2	343	12,005	32	29
Lemhi	15	5	563	19,705	73,018	66,085
Owyhee	4	3	77	2,695	12,459	11,276
Power		1	9	315		
Shoshone	57	2	3,416	119,560	15,056,131	13,626,559
Twin Falls		2	4	140		
Valley	3	4	48,508	1,697,780	138,157	125,039
Washington	2		2	70	3,371	3,051
Total: 1950	155	75	79,652	2,787,820	16,095,019	14,566,805
1949	171	82	77,829	2,724,015	10,049,257	9,095,085

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Ada							$210
Blaine	228,000	$47,424	5,469,200	$738,342	2,611,100	$370,776	1,694,298
Boise	100	21	2,400	324			178,987
Bonner	1,200	250	204,000	27,540	14,500	2,059	99,950
Boundary	1,900	395	267,600	36,126	30,900	4,388	48,445
Butte			11,000	1,485			1,590
Camas	500	104	5,400	729			6,307
Cassia			1,000	135	100	14	9,280
Clark	26,900	5,595	10,600	1,431			7,309
Clearwater							175
Custer	25,800	5,366	3,504,200	473,067	892,600	126,749	873,664
Elmore			400	54			224,293
Gem	600	125	9,000	1,215	700	99	23,350
Idaho			400	54			346,220
Jerome							105
Latah							12.034
Lemhi	85,300	17,742	1,130,400	152,604	23,500	3,337	259,473
Owyhee	47,100	9,797	1,400	189			23,957
Power							315
Shoshone	3,791,000	788,528	189,394,000	25,568,190	172,205,000	24,453,110	64,555,947
Twin Falls							140
Valley	600	125	6,000	810	1,300	185	1,823,939
Washington	5,000	1,040	33,000	4,455	300	43	8,659
Total: 1950	4,214,000	876,512	200,050,000	27,006,750	175,780,000	24,960,760	70,198,647
1949	2,876,000	566,572	158,598,000	25,058,484	153,110,000	18,985,640	56,429,796

Triumph, Bunker Hill & Sullivan mill tailing dump, Sunshine, Tamarack, and Spokane-Idaho properties.

Zinc.—Idaho's output of recoverable zinc increased to 87,890 tons in 1950, 11,335 tons more than that in 1949. About 98 percent of the 1950 State total came from the Coeur d'Alene region and most of the remainder from the Warm Springs district. Zinc-lead ore and old tailings concentrated yielded 91 percent of the State total zinc; old

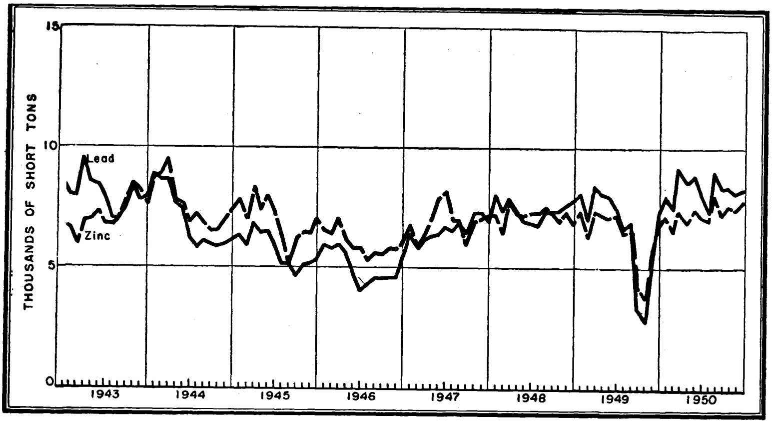

FIGURE 2.—Mine production of lead and zinc in Idaho, 1943–50, by months, in terms of recoverable metals.

lead-smelter slag smelted and fumed, 5 percent; and zinc ore concentrated and lead ore concentrated, 3 percent.

Nine properties (each producing over 6,000,000 pounds of zinc)—the Star, Page, Morning, Bunker Hill & Sullivan, Sidney, Frisco, Bunker Hill slag dump, Spokane-Idaho, and Tamarack—supplied 83 percent of the State total in 1950.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	3,043	1,087,527	144	8,008	7,185
February	3,696	1,193,936	155	7,572	6,580
March	7,148	1,625,320	208	9,227	7,412
April	8,540	1,353,175	166	8,642	6,908
May	7,318	1,398,376	194	8,891	7,450
June	7,345	1,310,878	178	8,026	7,162
July	9,835	1,197,572	158	7,377	7,058
August	8,053	1,574,027	192	9,055	8,040
September	5,364	1,417,376	179	8,339	7,212
October	7,631	1,315,378	168	8,382	7,608
November	5,785	1,326,077	180	8,179	7,465
December	5,894	1,295,377	185	8,327	7,810
Total: 1950	79,652	16,095,019	2,107	100,025	87,890
1949	77,829	10,049,257	1,438	79,299	76,555

The Sullivan Mining Co. operated its electrolytic zinc plant near Bradley continuously during 1950, producing 53,922 tons of special high-grade slab zinc and 295 tons of cadmium. Output of metal in the year substantially exceeded that of any year during the 22 years' continuous operation of the plant. In addition, the plant recovered 8,957 tons of zinc, 3,985 tons of lead, 198 tons of copper, 550,665 ounces of silver, and 1,994 ounces of gold from residues, dross, and other byproducts.

MINING INDUSTRY

Production of zinc-lead ore and old tailings (by far the chief ore output of the State) increased from 1,920,206 tons to 2,074,300, gold ore from 624,083 tons to 632,884, and zinc ore and old slag from 49,401 tons to 74,416, and silver ore from 175,225 tons to 334,163; lead ore decreased from 287,664 tons to 182,905. The Yellow Pine mine at Stibnite, Valley County, produced 98 percent of the gold ore mined in Idaho in 1950. Output increased from 610,988 tons in 1949 to 620,800 tons in 1950. About 91 percent of the silver ore, over 99 percent of the zinc ore and old slag, 96 percent of the zinc-lead ore and old tailings, and 95 percent of the lead ore were produced in the Coeur d'Alene region. Placer mining indicated greater activity, and production of gold from this source increased. Sixteen dredges (11 dragline, 4 bucket-line, and 1 suction) recovered 17,087 fine ounces of gold in Idaho in 1950; 13 dredges (7 dragline, 4 bucket-line and 2 suction) recovered 14,761 fine ounces of gold in 1949.

ORE CLASSIFICATION

Details on ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	38	632,884	55,731	174,878	6,323	11,977	700
Dry gold-silver ore	6	748	862	13,665	241	6,304	
Dry silver ore	16	334,163	809	9,721,043	2,574,359	10,447,901	603,869
Total	60	967,795	57,402	9,909,586	2,580,923	10,466,182	604,569
Copper ore	9	787	9	20,038	89,045	4,911	
Lead ore	41	182,905	805	730,867	117,364	22,700,268	2,014,513
Lead-copper ore	1	4		411	515	400	100
Zinc ore	7	[2] 74,416	14	29,320	9,478	2,309,117	12,549,607
Zinc-lead ore	53	2,074,300	3,858	5,398,836	1,416,075	164,563,322	160,609,911
Zinc-lead-copper ore	1	8	3	653	600	5,800	1,300
Total lode mines	155	[2] 3,300,215	62,091	16,089,711	4,214,000	200,050,000	175,780,000
Gravel (placer operations)	75		17,561	5,308			
Total: 1950	230	[2] 3,300,215	79,652	16,095,019	4,214,000	200,050,000	175,780,000
1949	253	[3] 3,057,075	77,829	10,049,257	2,876,000	158,598,000	153,110,000

[1] Detail will not necessarily add to totals because some mines produce more than 1 class of ore.
[2] Includes 51,366 tons of old lead-smelter slag.
[3] Includes 22,389 tons of old lead-smelter slag.

METALLURGICAL INDUSTRY

Of the 3,300,215 tons of ore produced in Idaho in 1950, 3,231,079 tons (98 percent) were treated at milling plants, and the remaining 69,136 tons (2 percent) were shipped crude to smelters.

In 1950 milling plants treated principally zinc-lead ore and old tailings (2,074,205 tons), gold ore (632,600 tons), silver ore (325,943 tons), lead ore (174,915 tons), and zinc ore (22,841 tons). Current hot lead-smelter slag totaling 143,916 tons was fumed, and 51,366 tons of old dump lead-smelter slag was delivered for smelting and fuming. Metals recovered from the old dump slag were credited to the Bunker Hill smelter dump, and metals recovered from the hot slag were credited to various producers of the ores and concentrates.

The Bunker Hill & Sullivan Mining & Concentrating Co. operated its Bradley lead smelter and refinery throughout the year on ore and concentrates, chiefly from the Coeur d'Alene region. Smelter output in 1950 exceeded that for any of the preceding 20 years. The company also operated its antimony and cadmium plants, 2,000-ton flotation mill (including a sink-and-float unit), 300-ton tailing-treatment plant for recovering silver, iron, lead, and zinc from old jig tailings, and 450-ton zinc slag-fuming plant at Bradley. According to the company annual stockholders' report for 1950, the smelter produced 3,668 ounces of gold, 11,949,907 ounces of silver, 174,428 pounds of cadmium, 1,398 tons of copper, 1,151 tons of antimony, 14,950 tons of zinc, and 75,249 tons of lead. The slag-fuming plant yielded 21,218 tons of deleaded zinc fume and 4,340 dry tons of zinc-lead fume.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	17,561	5,308			
Amalgamation	2,647	1,946			
Cyanidation	259	10			
Smelting of ore	1,656	217,910	130,399	4,919,497	9,794,664
Smelting of concentrate	57,529	15,869,845	4,083,601	195,130,503	165,985,336
Total: 1950	79,652	16,095,019	4,214,000	200,050,000	175,780,000
1949	77,829	10,049,257	2,876,000	158,598,000	153,110,000

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore and old tailings treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Blaine	49,362			9,462	1,314	513,908	221,142	5,419,589	2,552,886
Boise	108	115	59						
Bonner	1,150			97	2	6,327	535	106,878	2,465
Boundary	4,300			43	55	779	600	21,800	20,100
Cassia	500	259	10						
Custer	31,300	281	370	2,430	485	123,311	17,956	2,350,420	793,714
Elmore	8,941	1,915	1,404	420	3,441	32,903			
Gem	1,360	114	60	95	479	1,132	600	8,935	700
Idaho	535	136	41	4	12	11		200	
Lemhi	22,292	80	11	706	8	30,131	53,300	48,000	
Shoshone	2,490,431	6	1	308,730	3,261	15,024,270	3,789,468	187,174,681	162,615,471
Valley	620,800			24,822	48,472	137,073			
Total: 1950	3,231,079	2,906	1,956	346,809	57,529	15,869,845	4,083,601	195,130,503	165,985,336
1949	3,011,615	1,214	808	296,901	60,704	9,870,960	2,752,716	154,307,482	148,378,476
BY CLASS OF CONCENTRATE SHIPPED TO SMELTER									
Dry gold				25,293	52,002	170,180	175	1,123	
Dry gold-silver				55	453	9,267			
Copper				2,900	336	1,670,785	766,348	72,511	
Lead				147,337	2,717	5,924,229	1,099,987	178,150,829	15,366,416
Lead-copper				17,532	249	7,499,725	1,694,736	7,631,064	540,997
Zinc				151,062	1,289	571,647	508,264	8,985,035	149,728,749
Zinc-lead				570	8	14,760	3,221	250,444	349,174
Dry iron (from zinc-lead ore)				2,060	475	9,252	10,870	39,497	
Total: 1950				346,809	57,529	15,869,845	4,083,601	195,130,503	165,985,336

B. For ore and old tailings shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Blaine	527	617	5,589	6,858	49,611	58,214
Boise	70	89	974	100	2,400	
Bonner	8,235	192	63,626	665	97,122	12,035
Boundary	273	1	5,382	1,300	245,800	10,800
Butte	13		116		11,000	
Camas	30	139	673	500	5,400	
Cassia	6		63		1,000	100
Clark	197	1	274	26,900	10,600	
Custer	4,113	11	47,073	7,844	1,153,780	98,886
Elmore	81	82	2,502		400	
Gem	1	2	8		65	
Idaho	11	12	32		200	
Lemhi	3,143	453	42,876	32,000	1,082,400	23,500
Owyhee	499	49	12,439	47,100	1,400	
Shoshone	[1] 51,738	3	31,838	1,532	2,219,319	9,589,529
Valley	16	3	1,074	600	6,000	1,300
Washington	183	2	3,371	5,000	33,000	300
Total: 1950	[1] 69,136	1,656	217,910	130,399	4,919,497	9,794,664
1949	[2] 45,460	833	173,108	123,284	4,290,518	4,731,524

For footnotes, see end of table.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal—Continued

B. For ore and old tailings shipped directly to smelters—Continued

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY CLASS OF MATERIAL						
Dry gold	284	701	2,173	5,723	2,842	----------
Dry gold-silver	198	129	4,028	241	6,304	----------
Dry silver	8,220	194	63,864	5,000	1,882	235
Copper	762	9	20,038	87,745	4,911	----------
Lead	7,990	619	100,845	29,593	2,815,474	115,341
Lead-copper	4	----------	411	515	400	100
Zinc	[1] 51,575	1	24,599	685	2,054,644	9,649,217
Zinc-lead	95	----------	1,299	297	27,240	28,471
Zinc-lead-copper	8	3	653	600	5,800	1,300
Total: 1950	[1] 69,136	1,656	217,910	130,399	4,919,497	9,794,664

[1] Includes 51,366 tons of old lead-smelter slag smelted and fumed.
[2] Includes 22,389 tons of old lead-smelter slag smelted and fumed.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE AND OLD TAILINGS TREATED AT MILLS						
Dry gold	632,600	69,027	219,549	980	11,450	1,400
Dry gold-silver	550	850	11,200	----------	----------	----------
Dry silver	325,943	786	9,853,833	3,571,444	11,024,561	908,976
Copper	25	----------	6	1,750	----------	----------
Lead	174,915	317	745,991	130,876	22,834,334	3,788,156
Zinc	22,841	22	8,987	13,200	415,121	4,126,487
Zinc-lead	2,074,205	7,623	5,918,990	2,063,879	181,647,989	182,800,530
Total: 1950	3,231,079	78,625	16,758,556	5,782,129	215,933,455	191,625,549
1949	3,011,615	80,776	10,633,801	4,023,248	175,627,536	174,960,702
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	25,293	52,002	170,180	235	1,227	----------
Dry gold-silver	55	453	9,267	----------	----------	----------
Copper	2,900	336	1,670,785	797,265	119,081	6,900
Lead	147,337	2,717	5,924,229	1,293,825	181,232,643	19,113,606
Lead-copper	17,532	249	7,499,725	1,993,808	7,763,180	684,825
Zinc	151,062	1,289	571,647	542,135	9,383,043	155,180,298
Zinc-lead	570	8	14,760	3,787	256,758	371,829
Dry iron (from zinc-lead ore)	2,060	475	9,252	11,151	65,927	63,681
Total: 1950	346,809	57,529	15,869,845	4,642,206	198,821,859	175,421,139
1949	296,901	60,704	9,870,960	3,086,804	157,319,815	156,768,612

For footnotes, see end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content—Continued

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE AND OLD TAILINGS SHIPPED DIRECTLY TO SMELTERS						
Dry gold	284	701	2,173	8,906	3,113	
Dry gold-silver	198	129	4,028	246	10,436	
Dry silver	8,220	194	63,864	5,167	2,836	297
Copper	762	9	20,038	90,038	7,336	
Lead	7,990	619	100,845	38,820	2,907,310	144,287
Lead-copper	4		411	606	449	162
Zinc	[1] 51,575	1	24,599	854	2,090,378	12,197,495
Zinc-lead	95		1,299	341	27,932	33,371
Zinc-lead-copper	8	3	653	687	5,915	1,608
Total: 1950	[1] 69,136	1,656	217,910	145,665	5,055,705	12,377,220
1949	[2] 45,460	833	173,528	139,466	4,430,237	6,161,628

[1] Includes 51,366 tons of old lead-smelter slag smelted and fumed.
[2] Includes 22,389 tons of old lead-smelter slag smelted and fumed.

REVIEW BY COUNTIES AND DISTRICTS

BLAINE COUNTY

Little Wood River (Muldoon) District.—Lessees operated the Eagle Bird mine from July to November and produced 758 tons of zinc-lead ore containing nearly 5 ounces of gold, 6,734 ounces of silver, 4,500 pounds of copper, 105,690 pounds of lead, and 99,417 pounds of zinc; the ore was treated in the Combined Metals Reduction Co. flotation mill at Bauer, Utah. The Eagle Bird property also produced 114 tons of lead smelting ore during the year.

Mineral Hill and Camas District.—The Snyder Mining and Development Co. worked the Apache Mines from September through December and treated 3,200 tons of zinc-lead ore in the 100-ton flotation mill at the property. Development of the Snoose mine in Colorado Gulch near Hailey during the last half of 1950 yielded 396 tons of zinc-lead ore, which was shipped to the Bauer mill for treatment. The remaining district output was 216 tons of gold smelting ore shipped from the Camas group, 79 and 8 tons, respectively, shipped from the Donavan Mines and the Treasure Vault property, and small tonnages of zinc-lead milling ore from the Lead Metals mine and the Red Cloud claim.

Warm Springs District.—Production of zinc-lead ore from the Triumph mine of the Triumph Mining Co. decreased from 49,014 tons in 1949 to 44,846 in 1950. All the ore, containing 4,161 ounces of gold, 625,572 ounces of silver, 286,835 pounds of copper, 6,268,451 pounds of lead, and 3,167,007 pounds of zinc, was shipped to Bauer, Utah, for treatment. Development at the Homestake mine during the summer yielded 41 tons of zinc ore and 26 tons of zinc-lead ore, which was treated at smelters in Utah. Remaining district production in 1950 came from zinc and zinc-lead ore shipped from the Red Top property and a claim worked by L. B. & J. B. Hall.

BOISE COUNTY

Boise Basin District (Centerville, Placerville, Idaho City, Pioneerville, Quartzburg).—The chief producer in the district in 1950 was the Idaho-Canadian Dredging Co., which operated its 6-cubic-foot bucket-line dredge on Moores Creek near Idaho City from March 24 through the remainder of the year, treating 960,000 cubic yards of gravel. Small-scale hand methods at 15 placers recovered 47 ounces of gold and 5 of silver and suction dredging 15 ounces of gold and 4 of silver. Lode output for the district in 1950 consisted of 18 tons of lead smelting ore from the Come-Back mine; small tonnages of gold ore treated by amalgamation at the Sunshine group, the Red Rose, and five other properties; and gold ore shipped to smelters from the Gold Hill, Granite Creek, and the Hildamae mines.

Grimes Pass District.—Hydraulicking of gravels at the J. S. placer in April and May recovered 67 fine ounces of gold and 21 of silver.

BONNER COUNTY

Clark Fork District.—The largest operation in the district in 1950 was the Whitedelf mine, worked by lessees during the entire year. A total of 740 tons of lead ore was milled in a 75-ton flotation mill at the mine. Other production in the district included 170 tons of lead milling ore and 152 tons of lead smelting ore from the Hope mine and 6 tons of lead smelting ore from the Lawrence group.

Lakeview District.—The Weber mine was worked during most of the year, and 8,062 tons of high-siliceous silver ore was shipped to the smelter at Tacoma, Wash. Approximately 240 tons of silver ore from the Idaho-Lakeview property was treated at a custom flotation mill. Remaining district output came from 7 tons of silver smelting ore produced at the Keep Cool claim.

Pend d'Oreille District.—Output in 1950 comprised 6 tons of copper smelting ore from the Brown Bear property and 2 tons of silver ore from the Katherine claim.

BOUNDARY COUNTY

Moyie Yahk District.—Zinc-lead ore from the Regal claim was milled during the year and yielded 29 tons of lead concentrate and 14 of zinc concentrate.

Port Hill District.—Lessees operated the Idaho-Continental mine and shipped 273 tons of lead smelting ore during the year.

BUTTE COUNTY

M. C. Settles worked the Wilbert mine in the Dome district a few months in 1950 and shipped 13 tons of lead ore to a smelter in Utah.

CAMAS COUNTY

Lessees (J. R. Davies & Sons) operated the Princess-Blue Ribbon mine near Fairfield in 1950 and shipped 30 tons of lead smelting ore to a smelter in Utah.

CASSIA COUNTY

Blackpine District.—Ore treated by cyanidation at the Gem group by the Duvall Co. yielded 259 ounces of gold and 10 of silver. A small tonnage of lead smelting ore was shipped from the Old Dominion mine during the year.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Idaho in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Ada County: Highland		1			6	6							$210
Blaine County:													
Galena	1		27				200		200		2,000	2,100	749
Little Wood River (Muldoon)	1		872	3		3	7,225		7,225	3,900	115,800	75,700	33,837
Mineral Hill and Camas	8		3,979	627		627	9,099		9,099	7,200	54,600	61,500	47,782
Warm Springs	4		45,011	1,301		1,301	502,973		502,973	216,900	5,296,800	2,471,800	1,611,930
Boise County:													
Boise Basin	10	17	162	167	4,775	4,942	1,012	1,191	2,203	100	2,400		175,309
Grimes Pass		1			67	67		21	21				2,364
Summit Flat	1		16	37		37	21		21				1,314
Bonner County:													
Clark Fork	3		1,068				6,762		6,762	600	200,200	12,300	35,019
Lakeview	3		8,309	194		194	61,179		61,179	200	3,800	2,200	63,027
Pend d'Oreille	2		8				2,012		2,012	400			1,904
Boundary County:													
Moyie Yahk	1		4,300	55		55	779		779	600	21,800	20,100	8,552
Port Hill	1		273	1		1	5,382		5,382	1,300	245,800	10,800	39,893
Butte County: Dome	1		13				116		116		11,000		1,590
Camas County: Beaver Creek	1		30	139		139	673		673	500	5,400		6,307
Cassia County:													
Blackpine	1		500	259		259	10		10				9,074
Unorganized	1		6				63		63		1,000	100	206
Clark County: Birch Creek	2		197	1		1	274		274	26,900	10,600		7,309
Clearwater County:													
Clearwater River		1			1	1							35
Pierce		1			4	4							140
Custer County:													
Alder Creek	2		464	6		6	2,781		2,781	2,300	124,000	55,800	27,869
Bayhorse	8		34,339	36		36	157,031		157,031	23,500	3,357,000	832,200	719,636
Boulder	1		50	1		1	1,158		1,158		19,600	4,400	4,354
Seafoam	2		9				147		147		3,600	200	647
Yankee Fork	2	6	551	734	2,418	3,152	9,637	2,338	11,975				121,158
Elmore County:													
Bear Creek	1		65	26		26	10		10				919
Middle Boise	4	1	8,954	5,407	1	5,408	36,799		36,799		400		222,639
Pine Grove	1		3	5		5							175
Snake River		2			16	16							560
Gem County: West View (Pearl)	2		1,361	595		595	1,200		1,200	600	9,000	700	23,350

Idaho County:													
Burgdorf-Marshall Lake		1			95	95		21	21				3,344
Dewey-Harpster	1		2	1		1							35
Dixie	2	1	9	8	52	60	10	10	20		200		2,145
Elk City		8			7,928	7,928		1,327	1,327				278,681
Florence and French Creek		2			80	80		32	32				2,829
Lower Salmon River		2			60	60		10	10				2,109
Orogrande		1			2	2							70
Salmon River		2			10	10							350
Ten Mile	5	3	531	149	1,445	1,594	74	274	348		200		56,132
Warren	2	4	4	2	13	15							525
Jerome County: Snake River		2			3	3							105
Latah County: Gold Creek		2			343	343		32	32				12,034
Lemhi County:													
Birch Creek	1		40				253		253		15,000	100	2,268
Blue Wing	1		21,914	8		8	30,131		30,131	52,000	48,000		44,846
Eureka	2		26	2		2				1,300			340
Gibbonsville		2			8	8							280
Indian Creek	2		355	77		77	21		21	600			2,839
Junction	2		54				411		411	9,500	400	100	2,416
Mackinaw	1	3	1		14	14				300			552
Mineral Hill	1		1	2		2							70
Nicholia	1		234	1		1	1,391		1,391	500	136,200	13,000	21,631
Spring Mountain	1		26	1		1	126		126	100	6,600	500	1,132
Texas	3		2,784	450		450	40,685		40,685	21,000	924,200	9,800	183,099
Owyhee County:													
Carson or French	2	2	33	43	21	64	980	20	1,000				3,145
Castle Creek	1		2				158		158				143
Snake River		1			7	7							245
South Mountain	1		464	6		6	11,301		11,301	47,100	1,400		20,424
Power County: Snake River		1			9	9							315
Shoshone County:													
Beaver	8	2	48,050	60	146	206	39,179	22	39,201	29,500	2,085,600	4,529,400	973,556
Evolution	11		416,797	650		650	9,706,824		9,706,824	2,555,500	11,802,200	2,914,400	11,346,602
Hunter	7		403,862	363		363	687,218		687,218	243,200	31,899,000	62,018,000	13,798,179
Lelande	9		182,995	198		198	453,568		453,568	86,500	17,097,000	14,440,600	4,794,084
Placer Center	6		146,331	140		140	351,681		351,681	59,500	13,280,200	7,645,100	3,213,996
Saint Joe	1		3							300			62
Summit	1		1,400				147		147	300	16,800	63,500	11,480
Yreka	14		1,342,731	1,859		1,859	3,817,492		3,817,492	816,200	113,213,200	80,594,000	30,417,988
Twin Falls County: Snake River		2			4	4							140
Valley County:													
Deadwood Basin	1		8	3		3	653		653	600	5,800	1,300	1,789
South Fork of Salmon River		4			33	33		10	10				1,164
Unorganized (Knox)	1		8				421		421		200		408
Yellow Pine	1		620,800	48,472		48,472	137,073		137,073				1,820,578
Washington County:													
Heath	1		44				180		180		31,800	300	4,499
Washington	1		139	2		2	3,191		3,191	5,000	1,200		4,160
Total Idaho	155	75	3,300,215	62,091	17,561	79,652	16,089,711	5,308	16,095,019	4,214,000	200,050,000	175,780,000	70,198,647

CLARK COUNTY

Birch Creek District.—Output in 1950 consisted mainly of 181 tons of copper ore produced from the Valley View mine.

CUSTER COUNTY

Alder Creek District.—Lessees operated the Homestake mine throughout the year and produced lead and zinc smelting ore, which was shipped to Utah for treatment. The remainder of the district output was 75 tons of lead smelting ore shipped from the Horseshoe mine, 4 miles west of Mackay.

Bayhorse District.—Zinc-lead ore from the Clayton mine, owned by the Clayton Silver Mines, continued to be the most important production in the district. The company reported that 30,749 tons of ore treated in its 120-ton flotation mill yielded 1,745 tons of lead concentrate and 630 of zinc concentrate. The concentrates contained 32 ounces of gold, 114,044 ounces of silver, 20,869 pounds of copper, 2,391,666 pounds of lead, and 830,859 pounds of zinc. According to the annual stockholders' report, the outstanding feature of company operations in 1950 was development of the North ore shoot on the new 400 level. Although the northern limit of the ore body on the 400 level was not determined, the part developed during the year was 280 feet long and over 40 feet wide. The company reports that stoping in this area has produced the best grade of ore yet found in the property.

Most of the remainder of the district output comprised 3,457 tons of lead ore from the Red Bird mine, 53 tons of copper smelting ore from the Ramshorn and Beardsley groups, and small tonnages of lead smelting ore from the Last Chance group, St. Joe, South Butte, and Turtle mines.

Boulder District.—Livingston Mines, Inc., operated its mine near Clayton 3 months of the year and shipped 50 tons of ore containing 1 ounce of gold, 1,158 ounces of silver, 19,600 pounds of lead, and 4,400 pounds of zinc to Montana and Utah smelters.

Seafoam (Greyhound) District.—District output in 1950 comprised 2 tons of zinc-lead ore from the Hard Scrabble mine and 7 tons of lead smelting ore from a property operated by Carl Anderson of Stanley, Idaho.

Yankee Fork District.—Placer gold continued to be the most important output in the Yankee Fork district. Principal placer operations included the Jordan Placers, Inc., dragline and nonfloating washing plant on Jordan Creek and the Warren Dredging Co. bucketline dredge on the Yankee Fork placer. The lode output of the district consisted of gold ore from the Gold Star lode and the Lucky Boy and Peak claims.

ELMORE COUNTY

Bear Creek (Rocky Bar) District.—Total district output in 1950 was derived from amalgamation of gold ore produced at the Empire and Independence properties.

Middle Boise (Atlanta) District.—Gold ore from the Boise-Rochester group operated by the Talache Mines, Inc., continued to be the principal production from the Middle Boise district. The company operated the group and its 400-ton amalgamation and concentration mill throughout the year and produced 8,825 tons of gold ore, which yielded 5,325 ounces of gold and 34,292 of silver. Other district output included gold ore treated by amalgamation at the Golden Stringer claim and gold-silver smelting ore shipped from the Tahoma lode.

GEM COUNTY

Gold ore from the Dewey group at Pearl and the Old Man property, both in the West View district, was the only output in Gem County in 1950. The Gem State Consolidated Mines, Inc., operated the Dewey property throughout the year and treated 890 tons of gold ore in a 25-ton amalgamation and concentration mill at the property. The mill proved defective during the year and was returned to the manufacturer in August. Most of the gold ore produced at the Old Man mine was treated by amalgamation and concentration, but a small tonnage was shipped to a Utah smelter for treatment.

IDAHO COUNTY

Burgdorf-Marshall Lake District.—The only output in the Burgdorf-Marshall Lake district in 1950 was 95 ounces of gold and 21 of silver recovered by hydraulicking and sluicing at the Golden Rule claim.

Dixie District.—Harry L. Bracken worked the Dixie placers during the summer months and recovered 52 ounces of gold and 10 of silver. A small quantity of gold smelting ore was shipped during the year from the Haystack and Skyhigh mines.

Elk City District.—Output in the Elk City district in 1950 consisted exclusively of placer gold and silver from eight properties. The principal producer continued to be the Warren Dredging Corp., which operated a bucket-line dredge on the Wild Rose group. A dragline and floating washing plant were operated on the American River by the Tyee Mining Co. from April to October. Gold and silver recovered from bucket-line-dredge operations of the H. & H. Mines, Inc., on Red Horse Creek were shipped to the Seattle Assay Office. The remainder of the district gold output came from five small-scale ground-sluicing operations.

Lower Salmon River District.—Gold and silver were recovered during the year from placer operations on the Sunshine and Lone Pine claims.

Ten Mile District.—In 1950 five lode mines and three placer mines were worked in the Ten Mile district. Brown, Karr & McHargue operated a dragline and floating washing plant on the South Fork of Clearwater River from April 10 to November 11; 172,000 cubic yards of gravel were treated, yielding 1,378 ounces of gold and 263 of silver. Placer gold and silver were also recovered from the Kleesattel and Twin Meadows claims. Most of the remaining district production came from gold ore amalgamated and concentrated at the Bob and New York mines and gold ore amalgamated at the Lone Pine and Wonder properties.

LATAH COUNTY

Placer gold and silver from the Wawawai claim and operations on the North Fork of the Palouse River were the only output in 1950 in Latah County. The Behrens Bros. operated a dragline and dry-land washing plant on the North Fork of the Palouse River from June 15 to September 1 and produced 328 ounces of gold and 18 of silver from 64,000 cubic yards of gravel.

LEMHI COUNTY

Birch Creek District.—Lessees worked the Cabin mine from May to November and shipped lead smelting ore to Utah and Montana for treatment.

Blue Wing District.—The Bradley Mining Co. operated its Ima and Mazda property on Patterson Creek, 1 mile east of Patterson, throughout the year. The 150-ton concentrator at the property treated 21,914 tons of ore containing 35,832 ounces of silver and 10,429 pounds of tungsten (WO_3), as well as a little copper and lead. Lead-silver-copper concentrate (701 tons) was shipped to a smelter in Utah and tungsten concentrate (nearly 160 tons) to various destinations.

Indian Creek District.—The Sage Creek Lumber Co. operated the Sage Creek mine from February 1 through March 15 and amalgamated 350 tons of gold ore in a 25-ton mill built on the property in 1950; 75 ounces of gold and 11 of silver were recovered during operation of the mill.

Junction District.—In 1950 two mines—Blue Jay and Owl & Owl—produced 54 tons of ore containing 411 ounces of silver, 9,917 pounds of copper, 449 pounds of lead, and 162 pounds of zinc, which were shipped to a smelter in Montana.

Nicholia District.—Asa W. Reid operated the Nicholia group 7 months of the year and shipped 234 tons of lead ore to a smelter in Utah; the ore contained 1 ounce of gold, 1,391 ounces of silver, 633 pounds of copper, 138,582 pounds of lead, and 17,866 pounds of zinc.

Spring Mountain District.—Total district output in 1950 consisted of 26 tons of lead ore containing 1 ounce of gold, 126 ounces of silver, 157 pounds of copper, 6,751 pounds of lead, and 574 pounds of zinc, which were shipped to smelters in Utah.

Texas District.—Joe Hamilton continued to operate his Hill Top mine near Gilmore and shipped 2,713 tons of lead ore containing 448 ounces of gold, 39,901 ounces of silver, 27,148 pounds of copper, 922,397 pounds of lead, and 13,610 pounds of zinc. The remaining district output consisted of lead smelting ore shipped from the Latest Out and Valley View mines.

OWYHEE COUNTY

Carson or French (Silver City) District.—Two lode mines and two placer mines operated in the district in 1950. Most of the lode output was from 28 tons of gold-silver ore shipped from the South Central claim to smelters in Utah. Ground sluicing on the Lewis group placer during part of the year yielded 20 ounces of gold and 19 of silver.

South Mountain District.—District output in 1950 consisted of 464 tons of copper smelting ore from the South Mountain mine, which was shipped to Utah for treatment.

SHOSHONE COUNTY—COEUR D'ALENE REGION

The value of the metal output of the region was $64,555,947 (92 percent of the State value), an increase of $13,856,023 from 1949. The region remained the largest silver-producing area in the United States and ranked second in lead and zinc; it produced 94 percent of Idaho's silver in 1950, 90 percent of the copper, 95 percent of the lead, and 98 percent of the zinc. The chief zinc-producing properties in the region in 1950, according to rank, were the Star, Page, Morning, Bunker Hill & Sullivan, Sidney, Frisco, Bunker Hill & Sullivan slag dump, Spokane-Idaho, Tamarack, and Liberal King mines. The chief lead-producing properties, according to rank, were the Bunker Hill & Sullivan, Page, Star, Morning, Sherman, Dayrock, Sidney, and Frisco. The chief producers of silver, according to rank, were the Sunshine, Bunker Hill & Sullivan, Polaris, Silver Summit, and Silver Dollar properties.

Of the total material (2,542,169 tons) produced in 1950 in the Coeur d'Alene region, 78 percent was zinc-lead ore and old tailings, 12 percent silver ore, 7 percent silver-lead ore, and 3 percent zinc ore and lead-smelter slag.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in the Coeur d'Alene region, Shoshone County, 1946–50, and total 1884–1950, in terms of recoverable metals

Year	Mines producing		Ore (short tons)	Gold (lode and placer, fine ounces)	Silver (lode and placer, fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
1946	56	1	2,559,636	1,758	5,655,672	1,619,000	113,096,000	134,858,000	$33,673,731
1947	61	4	2,957,143	2,808	9,234,906	2,624,000	146,120,000	158,502,000	49,226,932
1948	65	7	3,165,780	3,362	10,598,338	2,775,000	165,174,000	167,601,000	62,168,955
1949	61	1	2,282,614	2,438	9,146,146	2,341,000	148,304,000	148,739,200	50,699,924
1950	57	2	2,542,169	3,416	15,056,131	3,791,000	189,394,000	172,205,000	64,555,947
Total 1884–1950	-----	-------	(1)	405,090	476,322,945	[2] 71,131	[2] 5,856,563	[2] 1,520,391	1,349,577,140

[1] Figure not available.
[2] Short tons.

Beaver District.—The principal district output in 1950 was zinc-lead ore from the Monitor group (Carlisle, Interstate, Silver Tip, and Amazon) worked by the Day Mines, Inc., in January and July through December; the ore was treated in the Carlisle 500-ton flotation mill near Wallace. Lessees worked the Parrott mine, owned by the Day Mines, Inc., and hauled 4,702 tons of zinc-lead ore to the Rex flotation mill near Wallace. Zinc-lead ore was produced during the year by lessees working the Blue Grouse property, also owned by the Day Mines, Inc. The Sunset Lease (a partnership in which Day Mines, Inc., has a 70-percent interest) was operated intermittently during the year by sublessees, and 4,355 tons of zinc-lead ore was hauled to custom mills in the Wallace area. Zanetti Bros. operated the waste dumps at the Sunset property and at the Interstate group; ore was treated at the Rex mill. Zinc-lead ore was also shipped by the Zanetti Bros. from the Interstate-Callahan group, operated under lease from the Day Mines, Inc.

Evolution District.—The principal operation in the district in 1950 was by the Sunshine Mining Co. The company reported that 251,877 tons of ore from the Sunshine and Chester veins was treated in its 1,350-ton flotation mill, yielding 20,331 tons of lead-silver concentrate containing 8,114,321 ounces of silver, 2,188,393 pounds of copper 10,556,621 pounds of lead, and some zinc and gold. A small quantity of copper-silver concentrate was produced also. In addition to the Sunshine Mining Co. ore, the mill treated ore from properties of the Polaris Mining Co., Silver Syndicate, Inc., Silver Dollar Mining Co., and Metropolitan Mines Corp. Development reported by the Sunshine Mining Co. in 1950 included 2,763 feet of raising, 3,886 of drifting, 3,773 of crosscutting, and 583 of diamond drilling.

Lessees worked the Big Creek tailing deposit intermittently during the year and hauled 3,908 tons of old zinc-lead tailings to the Zanetti Bros. mill at Osburn. A total of 108 tons of concentrates was produced, which contained 1 ounce of gold, 3,604 ounces of silver, 2,400 pounds of copper, 74,908 pounds of lead, and 54,454 pounds of zinc. Zanetti Bros. continued to work the DeBlock tailing deposit at the mouth of Lake Gulch and hauled old zinc-lead tailings to its mill at Osburn. A substantial quantity of similar material from the Osburn tailings was also treated.

According to the annual report of the Coeur d'Alene Mines Corp. for 1950, operations at the Mineral Point mine were mainly development, exploration, and maintenance. The only ore mined and treated was 2,020 tons containing 29,204 ounces of silver, 18,584 pounds of copper, and a little antimony and gold.

Hunter District (Mullan).—The Star mine of the Sullivan Mining Co. continued to be the principal producer in the Hunter district and in 1950 ranked first in the production of zinc and third in lead in Idaho. The company operated the mine and its 1,000-ton flotation mill all year and treated 267,259 tons of zinc-lead ore, yielding 10,065 tons of lead concentrate and 43,571 of zinc concentrate, which together contained 183 ounces of gold, 256,158 ounces of silver, 145,711 pounds of copper, 16,530,639 pounds of lead, and 46,207,581 pounds of zinc.

The Morning mine and 1,200-ton flotation mill of the Federal Mining & Smelting Co. at Mullan were operated continuously and at a higher rate than in 1949. The company reported that 107,890 tons of mine ore were treated in 1950 compared with 87,757 in 1949; the ore contained an average of 2.03 ounces of silver to the ton, 6.53 percent lead, and 8.46 percent zinc.

The Lucky Friday Silver-Lead Mines Co. continued to work its Lucky Friday mine during 1950 and hauled 14,971 tons of zinc-lead ore to the Golconda custom flotation mill for treatment. Other important producing properties in the district included the Golconda, Gold Hunter, Lucretia mines, and Morning tailings.

Lelande District (Burke, Mace, Frisco).—The lower levels of the Frisco mine were worked by the Federal Mining & Smelting Co. and the upper levels by the Hull Lease. From the lower levels, 84,907 tons of zinc-lead ore (containing an average of 1.35 ounces of silver to the ton, 4.32 percent lead, and 6.12 percent zinc) were hauled to the Morning mill at Mullan for treatment. From the upper levels, the Hull Lease treated in its own 90-ton flotation mill 21,441 tons of ore, containing an average of 0.41 ounce of silver to the ton, 0.92 percent lead, and 9.44 percent zinc. The Day Mines, Inc., operated its Sherman mine and 300-ton flotation mill near Burke at a slightly lower rate than in 1949. Development during the year included 2,298 feet of drifting. The Day Mines, Inc., also worked its Hercules mine throughout the year; ore was treated in the Sherman mill. The remainder of the district output was mainly zinc-lead ore milled from the N. P. Lease, Black Bear & Black Bear Fraction and Hecla mines, and zinc-lead old tailings from the Canyon Creek tailing deposit.

Placer Center District.—The principal producer of ore in the district in 1950 was the Tamarack mine of Day Mines, Inc. The property was worked throughout the year, and ore produced was treated in the Tamarack 400-ton flotation mill at Dorn. Day Mines, Inc., also operated its Dayrock mine and 250-ton flotation mill at Bunn. Zanetti Bros. worked the Nine Mile tailing deposit on Nine Mile Creek from September through December and shipped the material to their mill at Osburn. The remaining district production in 1950 consisted of lead ore from the Galena mine and zinc-lead ore from the Success group and Tamarack No. 5 mines.

Summit District (Murray).—Zinc ore milled from the Terrible Edith group, worked by lessees during the latter part of 1950, yielded 68 tons of concentrates containing, in terms of recoverable metal, 147 ounces of silver, 300 pounds of copper, 16,800 pounds of lead, and 63,500 pounds of zinc.

Yreka District (Kellogg).—The Bunker Hill & Sullivan mine at Kellogg continued to be the most important producer of ore in the district and the largest producer of lead in the State; it ranked second in silver and fourth in zinc. The daily capacity of the company's main flotation mill, which is equipped with a sink-and-float unit, was increased during the year from 2,000 tons to 3,000. According to the company annual report to stockholders, development and prospecting of the Bunker Hill mine were continued throughout the year, with satisfactory results. The extent of the new high-grade lead-silver ore body on the Bunker Hill No. 17 level was determined and is now considered by the company to be of first importance. This ore body has been found, in part, on No. 18 level. The Gordon crosscut from the Main No. 1 shaft on the lowest mine level disclosed what is believed to be the Emery vein, first of the expected ore occurrences on No. 25 level.

Ore reserves fully developed and ready for mining January 1, 1951, totaled 3,014,476 tons of zinc-lead-silver ore, an increase of 51,392 tons from January 1, 1950. The zinc slag-fuming plant of the Bunker Hill & Sullivan Mining & Concentrating Co. at Bradley ran continuously throughout 1950. During the year the plant received 143,916 tons of current hot slag from the lead furnaces of the Bunker Hill smelter at Bradley; the resulting zinc-lead fume (4,340 tons) was sent to the Bunker Hill lead smelter, and the zinc fume (21,218 tons) was shipped to smelters in Kansas and Texas. John George continued leasing operations in the upper levels of the Bunker Hill mine and treated about 15,000 tons of lead ore in his mill.

Production of zinc-lead-silver ore from the Page mine of the Federal Mining & Smelting Co. increased from 154,230 tons in 1949 to 159,663 in 1950. The ore, treated in the Page 500-ton flotation mill, contained an average of 3.56 ounces of silver to the ton, 7.03 percent lead, and 6.37 percent zinc. The mine ranked second in lead and zinc production in Idaho in 1950. Development completed during the year included 271 feet of shaft sinking, 2,588 feet of drifting, and 1,490 feet of crosscutting.

The Sidney Mining Co. operated its Sidney mine and 300-ton flotation mill throughout 1950. Production of zinc-lead-silver ore increased from 63,499 tons in 1949 to 85,731 in 1950; the ore contained an average of 2.17 ounces of silver to the ton, 4.95 percent lead, and 8.89 percent zinc. The Highland-Surprise Consolidated Mining Co. worked its mine on Stewart Creek continuously during the year.

Zinc-lead ore treated in the company 300-ton flotation mill dropped from 52,255 tons in 1949 to 32,100 in 1950. Mining and milling of zinc-lead ore from the Spokane-Idaho mine on Pine Creek were continuous throughout the year. The company 175-ton flotation mill treated 60,902 tons of zinc-lead ore in 1950 compared with 50,623 in 1949. The Sunset Minerals, Inc., operated the Liberal King mine on Pine Creek all year and treated about 32,000 tons of ore in its 100-ton flotation mill. Production of zinc-lead ore from the Little Pittsburgh mine on Denver Creek increased from 15,726 tons in 1949 to 21,104 in 1950. Most of the remainder of the district output came from zinc-lead ore from the Idaho, Nabob, and Senator Stewart mines.

VALLEY COUNTY

Deadwood Basin District.—Output in 1950 was 8 tons of zinc-lead-copper ore produced from the Deadwood mine.

Yellow Pine District.—The Bradley Mining Co. operated its Yellow Pine mine and 2,200-ton flotation mill at Stibnite all year. The company reported that in 1950 the mill treated 620,800 tons of ore containing 61,764 ounces of gold, 177,594 ounces of silver, and 7,495,112 pounds of antimony. The antimony and gold concentrates produced contained 48,472 ounces of gold, 137,073 ounces of silver, and 5,926,279 pounds of antimony.

WASHINGTON COUNTY

Heath District.—Total district output for 1950 consisted of 44 tons of lead ore, shipped to a smelter in Utah, from the Lead Zone Mining Co. property in Edna Mae Gulch.

Washington District.—The Silver Still Mining Co. operated its property on Dennet Creek from April through December 15 and shipped 139 tons of silver smelting ore containing 2 ounces of gold, 3,191 ounces of silver, 5,167 pounds of copper, and 2,136 pounds of lead to a smelter in Utah.

Missouri, Oklahoma, Kansas, and Arkansas

Silver, Copper, Lead, and Zinc

(MINE REPORT)

By F. F. Netzeband and Alice Feltch

GENERAL SUMMARY

MINE production of zinc and lead ores in the Tri-State district of Kansas, Oklahoma, and southwestern Missouri fluctuated over a wide range during 1950, reflecting the impact of world conditions on marginal producing areas. Tri-State production lagged during the first quarter of 1950, following similar conditions in the last quarter of 1949. Acceleration of the Government stockpiling program and the Korean War improved the demand for zinc, however, and resulted in higher concentrate prices during the remainder of the year.

Lead production in southeastern Missouri remained fairly uniform throughout 1950, increasing 6 percent over 1949. Silver recovery, a byproduct of the lead production from this region, increased 91 percent in 1950 over 1949, while copper, also a lead byproduct, increased 19 percent.

Zinc concentrate prices increased consistently from March 1950 to the year end, varying from a minimum of $55 to a high of $115 per ton, established in September and maintained for the remainder of the year. Erratic demand kept the price of lead declining until March, when a low of $126.07 per ton of concentrate was reached. A maximum of $218.42 was reached in October, and the price was sustained at that level until the year end.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of silver, copper, lead, and zinc in Arkansas, Kansas, Missouri, and Oklahoma in 1946–49 and in 1950, by States, in terms of recoverable metal [1]

	Mines producing	Material sold or treated		Silver	
		Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value
1946	269	13, 831, 590	10, 178, 620	69, 401	$56, 076
1947	254	11, 837, 403	6, 041, 783	93, 600	84, 708
1948	294	8, 537, 796	3, 760, 259	114, 187	103, 345
1949	232	10, 128, 129	3, 011, 718	123, 413	111, 695
1950					
Arkansas	2	42			
Kansas	66	1, 531, 435	101, 745		
Missouri	68	6, 384, 138	1, 036, 002	236, 273	213, 839
Oklahoma	119	2, 850, 880	855, 681		
Total 1950	255	10, 766, 495	1, 993, 428	236, 273	213, 839

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	1, 857	$601, 668	159, 256	$34, 717, 808	139, 574	$34, 056, 056	$69, 431, 608
1947	1, 760	739, 200	153, 838	44, 305, 344	109, 651	26, 535, 542	71, 664, 794
1948	2, 370	1, 028, 580	127, 614	45, 685, 812	85, 892	22, 847, 272	69, 665, 009
1949	3, 670	1, 445, 980	157, 153	49, 660, 348	79, 378	19, 685, 744	70, 903, 767
1950							
Arkansas			9	2, 430	8	2, 272	4, 702
Kansas			9, 487	2, 561, 490	27, 176	7, 717, 984	10, 279, 474
Missouri	2, 982	1, 240, 512	134, 626	36, 349, 020	8, 189	2, 325, 676	40, 129, 047
Oklahoma			20, 724	5, 595, 480	46, 739	13, 273, 876	18, 869, 356
Total 1950	2, 982	1, 240, 512	164, 846	44, 508, 420	82, 112	23, 319, 808	69, 282, 579

[1] Includes recoverable metal content of ore milled and old tailings or slimes re-treated during the calendar year indicated.

TABLE 3.—Mine production of silver, copper, lead, and zinc in Arkansas, Kansas, Missouri, and Oklahoma in 1950, by months, in terms of recoverable metal

Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	22, 572	301	13, 662	5, 684
February	22, 309	259	13, 566	5, 721
March	21, 515	290	14, 901	6, 167
April	19, 744	230	13, 513	5, 488
May	20, 933	279	14, 143	6, 453
June	20, 716	240	14, 527	7, 277
July	19, 899	246	13, 617	6, 860
August	21, 604	263	13, 716	7, 413
September	20, 414	202	13, 467	7, 449
October	20, 269	219	13, 445	8, 117
November	12, 273	245	13, 298	7, 970
December	14, 025	208	12, 991	7, 513
Total: 1950	236, 273	2, 982	164, 846	82, 112
1949	123, 413	3, 670	157, 153	79, 378

Silver.—Silver is recovered as a byproduct in the smelting of southeastern Missouri lead concentrates and smelter residues. All of the lead concentrates are not desilverized, and only the silver that is recovered is recorded in this report. Some silver is also obtained from a lead-copper concentrate which is recovered in the copper processing.

Of the silver produced in 1950, 229,235 fine ounces was recovered from lead smelting and 7,038 fine ounces from lead-copper concentrate reduction. A total of 123,413 fine ounces was recovered in 1949.

Copper.—Copper production in southeastern Missouri amounted to 2,982 tons in 1950 compared with 3,670 tons in 1949. This copper was recovered from both byproduct matte and lead-copper concentrates.

Lead.—Lead production, in terms of recoverable metal, from mines in the four-State area of Arkansas, Kansas, Missouri, and Oklahoma amounted to 164,846 tons in 1950 compared with 157,153 tons in 1949. Of the 1950 total, 133,680 tons (81 percent) originated in the southeastern Missouri region; 31,157 tons (19 percent) in the Tri-State district of southwestern Missouri, Kansas, and Oklahoma; and 9 tons

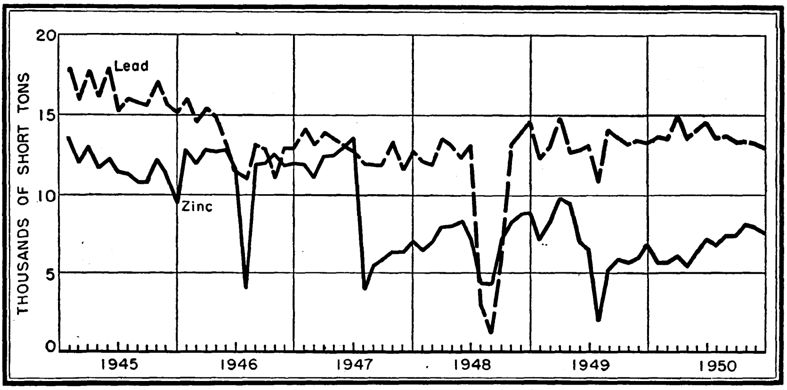

FIGURE 1.—Mine production of lead and zinc in Arkansas, Kansas, Missouri, and Oklahoma, 1945–50, by months, in terms of recoverable metal.

in Arkansas. In 1949 southeastern Missouri produced 126,269 tons, the Tri-State district, 30,883 tons, and Arkansas, 1 ton.

Zinc.—Zinc production from mines in the four-State area of Arkansas, Kansas, Missouri, and Oklahoma was, in terms of recoverable metal, 82,112 tons in 1950 compared with 79,378 tons in 1949. The Tri-State district (Oklahoma, Kansas, and southwestern Missouri) accounted for 80,558 tons (98 percent) of the recoverable zinc production for the four-State area, and southeastern Missouri for 1,546 tons (2 percent). Arkansas produced 8 tons during 1950. In 1949 the Tri-State district produced 78,628 tons of recoverable zinc; southeastern Missouri, 749 tons; and Arkansas, 1 ton.

MINING AND METALLURGICAL INDUSTRY

Zinc-lead mining operations during 1950 in the Tri-State district of southwestern Missouri, Kansas, and Oklahoma yielded 4,700,698 tons of ore, 5 percent more than the 4,470,778 tons produced in 1949. Re-treatment of tailings in the district declined nearly 40 percent in 1950 compared with 1949, Kansas production assuming the greatest portion of the decline. Exploratory drilling by private industry and the Bureau of Mines continued in the district on a reduced scale. Two hundred and fifty-five mines and 17 mills operated during the year; some were on a curtailed basis during the first half due to low concentrate prices of both zinc and lead.

Mine production in the southeastern Missouri disseminated-lead belt in 1950 continued at the same rate as that of 1949. There were 7,091,257 tons of ore mined in 1950, while 7,066,443 tons were produced in 1949. Nine mines and six mills accounted for the 1950 production.

All the ore produced in the region was concentrated by means of gravity and flotation methods. Custom mills remained an important factor in the industry, processing the ores from numerous small operations. These concentrates were shipped to smelters in Pennsylvania, Illinois, Missouri, Kansas, Oklahoma, and Texas. Lead smelters and refineries active in the region were the St. Joseph Lead Co. plant at Herculaneum, Mo., and the Eagle-Picher Mining & Smelting Co. plant at Galena, Kans. Zinc retort smelters active in the region were the Athletic Mining & Smelting Co., Fort Smith, Ark.; Blackwell Zinc Co., Blackwell, Okla.; Eagle-Picher Mining & Smelting Co., Henryetta, Okla.; and National Zinc Co., Inc., Bartlesville, Okla.

ORE CLASSIFICATION

Table 4 classifies the combined ore and old tailings produced in Arkansas, Kansas, Oklahoma, and Missouri in a manner comparable to the classes shown in the tables on ore classification in the other chapters devoted to mining in the Western States. The basis for classification is given in the gold and silver chapter of this volume. Additional details on the tenor of ore and old tailings milled and the concentrates produced in Kansas, Missouri, and Oklahoma are given in tables in the Tri-State District and Review by States sections that follow. Such tables are omitted for Arkansas because only small-scale, intermittent mining of lead and zinc was done there from 1918 through 1950.

TABLE 4.—Mine production of silver, copper, lead, and zinc in Arkansas, Kansas, Missouri, and Oklahoma in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines	Material sold or treated (short tons)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lead ore [1]	18	7,092,585	236,273	2,982	133,726	1,547
Zinc ore [2]	92	1,819,906			1,473	22,509
Zinc-lead ore	145	3,847,432			29,647	58,056
Total: 1950	255	12,759,923	236,273	2,982	164,846	82,112
1949	232	13,139,847	123,413	3,670	157,153	79,378

[1] Includes lead-copper ore from one mine; also 1,025,502 tons of old tailings remilled, concentrates from which were mixed with those from crude ore.

[2] Includes 967,926 tons of old tailings yielding 2,162 tons of recoverable zinc and 32 tons of recoverable lead.

TRI-STATE DISTRICT

The marginal mine production of the Tri-State district reflected domestic and world conditions as they affected the industry. Production lagged during the first quarter of 1950 when concentrate prices were low. In the second quarter, zinc prices improved, while lead prices remained low, causing district ore production to increase about 5 percent. In the last half of the year, when concentrate prices for both zinc and lead kept increasing, mine production was about 31 percent greater than in the first half, with the result that the full year's production was somewhat greater than that of 1949.

In 1950 the district produced 150,019 tons of zinc concentrates valued at $13,934,927 and 40,714 tons of lead concentrates valued at $6,245,660, for a combined production of 190,733 tons valued at $20,180,587. The district zinc production, in terms of recoverable metal, was 80,558 tons, while lead production was 31,157 tons. Zinc concentrate produced in 1949 amounted to 147,178 tons and lead concentrate, 41,471 tons, with recoverable content of 78,628 tons of zinc metal and 30,883 tons of lead.

TABLE 5.—Mine production of lead and zinc concentrates in the Tri-State district (Kansas, Oklahoma, and Southwestern Missouri), 1946–50

Year	Material milled (short tons)	Concentrates produced (short tons)		Concentrate recovery (percent)		Average assay of concentrates (percent)		Average value per ton of concentrates	
		Lead	Zinc	Lead	Zinc	Lead	Zinc	Lead	Zinc
FROM CRUDE ORE									
1946	8,271,512	30,468	224,910	0.37	2.72	77.40	59.88	$164.81	$116.15
1947	6,229,702	31,842	181,662	.51	2.92	77.41	59.68	190.72	107.42
1948	4,314,190	35,706	147,989	.83	3.43	76.64	59.09	231.85	87.10
1949	4,470,778	41,422	139,098	.93	3.11	76.00	59.44	188.76	77.53
1950	4,700,698	40,659	145,801	.86	3.10	78.10	59.74	153.45	93.10
FROM OLD TAILINGS REMILLED									
1946	10,178,620	182	33,795	0.002	0.33	48.35	58.60	90.85	117.10
1947	5,740,459	164	22,406	.003	.39	45.12	58.31	107.09	101.69
1948	2,595,903	156	11,620	.006	.45	51.28	58.47	155.14	89.50
1949	1,602,620	49	8,080	.003	.50	59.18	57.98	119.22	81.71
1950	967,926	55	4,218	.006	.44	58.18	56.95	121.13	85.66
DISTRICT TOTAL									
1946	18,450,132	30,650	258,705	0.17	1.40	77.23	59.71	164.37	116.27
1947	11,970,161	32,006	204,068	.27	1.70	77.25	59.53	190.30	106.79
1948	6,910,093	35,862	159,609	.52	2.31	76.53	59.04	231.51	87.27
1949	6,073,398	41,471	147,178	.68	2.42	75.98	59.36	188.68	77.76
1950	5,668,624	40,714	150,019	.72	2.65	78.08	59.66	153.40	92.89

Production from old tailings continued to decline sharply in 1950, the total treated being 40 percent less than in 1949. The 967,926 tons of old tailings yielded 4,218 tons of zinc concentrates and 55 tons of lead concentrates with a total value of $367,980 and accounted for 2,162 tons of recoverable zinc and 32 tons of recoverable lead.

TABLE 6.—Weekly quoted prices for 60-percent zinc concentrates and 80-percent lead concentrates at Joplin in 1950

[E&MJ Metal and Mineral Markets]

Zinc concentrates				Lead concentrates			
Week ended—	Price per short ton	Week ended—	Price per short ton	Week ended—	Price per short ton	Week ended—	Price per short ton
Jan. 7, 14	$57.00	May 20	$77.50	Jan. 7–Mar. 4	$147.67	July 1, 8	$133.27
Jan. 21–Mar. 11	55.00	May 27	82.50	Mar. 11	133.27	July 15–Aug. 12	147.67
Mar. 18, 25	57.00	June 3	91.00	Mar. 18–Apr. 15	126.07	Aug. 19	162.07
Apr. 1	59.00	June 10, 17	95.00	Apr. 22	129.67	Aug. 26	176.47
Apr. 8, 15	61.00	June 24	97.00	Apr. 29	133.27	Sept. 2	190.87
Apr. 22, 29	65.00	July 1–Sept. 2	99.00	May 6	136.87	Sept. 9–Oct. 21	205.27
May 6	69.00	Sept. 9–Dec. 31	115.00	May 13–June 17	147.67	Oct. 28	[1] 204.02
May 13	75.00			June 24	140.47	Nov. 4–Dec. 31	218.42

[1] Increased smelting charge of $1.25.

The five principal zinc producers in the Tri-State district in 1950, in order of output, were: Eagle-Picher Mining & Smelting Co. (Oklahoma and Kansas); Nellie B. Mining Co. (Oklahoma); National Lead Co., St. Louis Smelting & Refining Division (Kansas); Federal

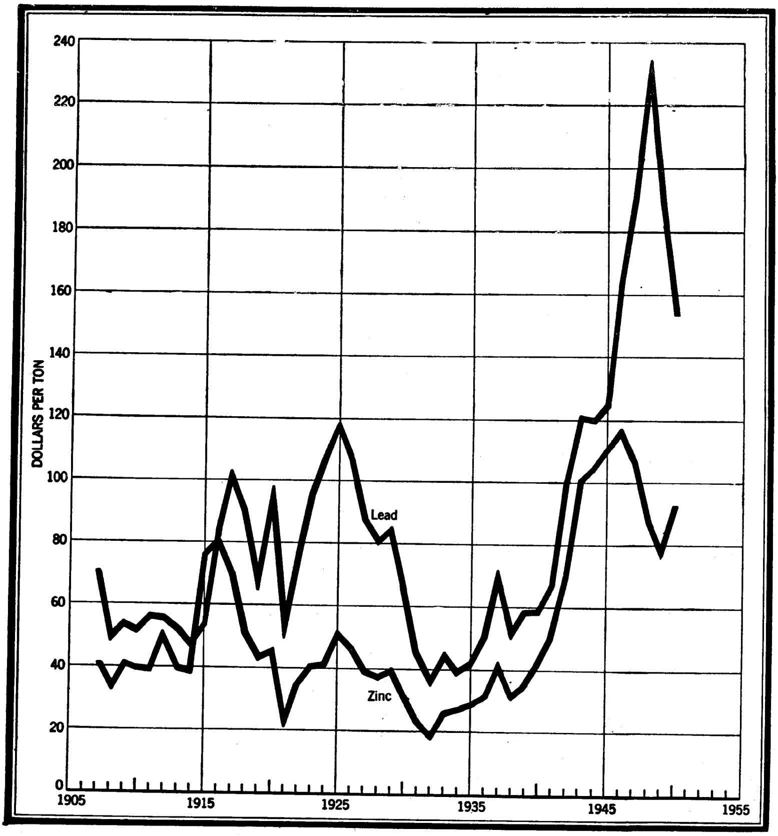

FIGURE 2.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907–50.

Mining & Smelting Co. (Oklahoma and Missouri); and Dale Mining Co. (Missouri). The five principal lead producers were as follows: Eagle-Picher, Nellie B., National, Federal, and W. M. & W. Mining Co. (Oklahoma).

In December of 1950 there were 16 mine mills, 1 tailings mill, and 3 clean-up mills operating, while 18 mine mills, 1 tailings mill, and 1 clean-up mill were operating during December 1949. About 80 mines were operating in December 1950 compared with 85 in December 1949; in addition to these, however, many small mines were active for only short periods during the year. The crude ore was hoisted from approximately 135 shafts, ranging in depth from 50 to 450 feet. Several open-pit operations continued during the year, and this mode

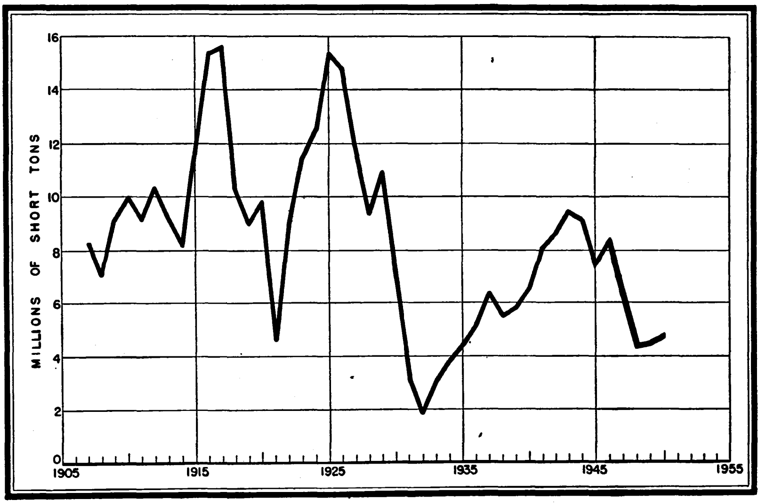

Figure 3.—Quantity of crude ore (rock) milled in the Tri-State district, 1907–50.

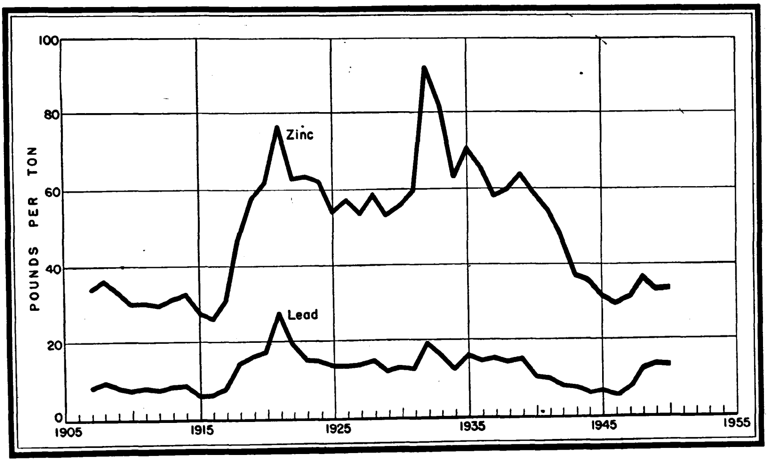

Figure 4.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907–50.

of mining seemed destined to become a larger factor in the district operations.

Prospecting and development programs were limited in the Tri-State district during 1950. The Federal Bureau of Mines continued churn drilling in the Melrose, Kans., area and at the Canyon Diggings in Newton County, Mo. Private drilling programs on record were Eagle-Picher, Federal, Carl McDonald at Leigh, Mo., Dale Mining Co. at Stark City, Mo., and F. W. Evans at Alba, Mo.

The Federal Mining & Smelting Co. purchased 5,000 acres of lands and mining leases and three mills (Jasper, Snapp, and Northside) from George W. Potter, Joplin mine operator, early in 1950 in the largest single transfer in the district. All this property was in the Joplin area. Federal also sold five mines (Buffalo, Maxine, Walker, Rainbow, and Donna Jane) to Fred Childress & Sons. These mines lie about 1 mile east of Picher, Okla. Potter & Sims later subleased the Snapp property from Federal and began open-pit operations on this tract, treating the ore at the Snapp mill.

St. Louis Smelting & Refining Division of National Lead Co. completed mechanization of its Baxter Springs, Kans., plant with the installation of additional high-capacity loaders and Diesel-powered trucks. Its Hartley No. 8 shaft was deepened to accommodate a 300-ton skip pocket, a new steel-head frame, and a 5-ton skip installed to handle the additional tonnage.

REVIEW BY STATES

MISSOURI

Missouri was again the principal lead-producing State in 1950, a rank it has maintained for 43 consecutive years. The 1950 annual production, amounting to 134,626 tons of recoverable lead, was 6 percent greater than the 1949 production of 127,522 tons. The major portion of this lead production—133,680 tons of recoverable lead—came from the southeastern disseminated-lead belt in St. Francois and Madison Counties, with a considerable volume also originating in the southwestern Missouri part of the Tri-State area. Production of zinc likewise showed a substantial increase over 1949. The 1950 production of 8,189 tons of recoverable zinc was nearly 39 percent greater than that of 1949. Silver and copper were also recovered as byproducts of the smelting of lead and lead-copper concentrates from this region.

Southeastern Missouri.—The 1950 output of 133,680 tons of recoverable lead from this important mining region showed a 6-percent gain over the 1949 output of 126,269 tons. Zinc production amounting to 1,546 tons of recoverable metal more than doubled 1949 output of 749 tons. St. Joseph Lead Co., the Nation's largest producer of lead, operated its group of mines and four mills (Bonne Terre, Desloge, Federal, and Leadwood) in St. Francois County throughout the year and supplied the major portion of the region's production. These mills have a combined daily capacity of 26,800 tons. Mineral separation is by gravity methods followed by flotation. Underground operations are completely mechanized, with electrified main haulage systems, battery shuttle haulage, and loading and jumbo drills. The four principal ore shafts are located at each of the mills and vary in depth from 276 to 541 feet. Ore from two other shafts at Doe Run is trucked to the Federal mill. A new development shaft was sunk near Hayden Creek to a depth of 950 feet. In addition, this company operated the Mine La Motte property in Madison County, Mo., comprising four operating shafts, varying in depth from 75 to 307 feet, and a 2,000-ton mill.

According to the president's report to employees, the company development program was able to maintain its ore reserves in balance with production. Substantial tonnages of low-grade zinc-lead ore were indicated in the Desloge and adjacent mine areas. Company exploration projects have led to the discovery of large conglomerate-lead ore bodies at both Hayden Creek and Indian Creek, outside the lead belt proper, and warrant installation of a 2,000-ton-per-day sink-float mill at Hayden Creek. A three-compartment shaft with 5-ton skips will be sunk 950 feet to the ore body.

TABLE 7.—Mine production of lead and zinc in Southeastern and Central Missouri, 1946–50, in terms of concentrate and recoverable metal [1]

Year	Lead concentrates (galena)		Zinc concentrates (sphalerite) [2]		Recoverable metal content [3]			
					Lead		Zinc	
	Short tons	Value [4]	Short tons	Value	Short tons	Value	Short tons	Value
1946	189,401	$21,677,221	1,731	$61,147	135,891	$29,624,238	451	$110,044
1947	183,084	31,762,029	560	15,996	129,581	37,319,328	[5] 295	71,390
1948	145,364	30,396,488	567	55,231	100,691	36,047,378	[5] 1,022	271,852
1949	179,725	32,665,768	1,074	79,347	126,269	39,901,004	[6] 749	185,752
1950	191,439	28,522,322	2,742	260,600	133,680	36,093,600	[7] 1,546	439,064

[1] Based on Southeastern and Central Missouri ore ("dirt") and old tailings treated at mills during calendar year indicated.
[2] Includes zinc-lead carbonate concentrates.
[3] In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.
[4] Values given are to a certain extent arbitrary, as part of the lead concentrates are smelted by the producer.
[5] Includes zinc recovered from lead-smelter slag.
[6] Includes zinc recovered from lead-smelter byproducts.
[7] Includes 180 tons recovered from byproduct matte from lead smelting.

TABLE 8.—Tenor of lead ore and concentrates in Southeastern Missouri disseminated-lead district, 1946–50

	1946	1947	1948	1949	1950
Total lead ore [1] ... short tons	5,491,239	5,856,334	5,384,861	7,066,443	7,091,257
Galena concentrate in ore ... percent	3.44	3.12	2.70	2.54	2.70
Average lead content of galena concentrates ... do	73.09	72.22	70.60	71.60	71.19
Average value per ton of galena concentrates	$114.39	$173.49	$209.11	$181.75	$148.99

[1] Includes lead-copper ore. Includes old tailings remilled: 1946—none; 1947—301,324 tons; 1948—1,164,356 tons; 1949—1,409,098 tons; 1950—1,025,502 tons.

In Madison County the National Lead Co., St. Louis Smelting & Refining Division, operated its Madison lead-copper mines and 1,200-ton all-flotation mill at Fredericktown. The company connected its Nos. 1 and 5 shafts by a haulage drift, and all the ore will be hoisted at No. 5 shaft in two 2-ton skips. Underground operations were fully mechanized with Diesel-powered trucks, loaders, and bulldozers. No. 1 shaft was used primarily for handling supplies and for ventilation.

Fredericktown Lead Co. operated its Catherine-Fleming mine and mill part of the year. Some additional lead production was reported from central Missouri and was incidental to the barite production in that region.

TABLE 9.—Mine production of lead and zinc in Southwestern Missouri, 1946–50, in terms of concentrate and recoverable metal [1]

Year	Lead concentrates				Zinc concentrates				Recoverable metal content [2]			
	Galena		Carbonate		Sphalerite		Silicate		Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	4, 220	$734, 676	84	$12, 067	40, 937	$4, 985, 668	332	$20, 243	3, 221	$702, 178	21, 783	$5, 315, 052
1947	3, 412	655, 080	168	23, 866	31, 480	3, 402, 384	763	49, 235	2, 665	767, 520	16, 779	4, 060, 518
1948	2, 004	474, 233	130	21, 465	10, 475	913, 538	60	3, 212	1, 597	571, 726	5, 441	1, 447, 306
1949	1, 574	340, 038	14	1, 618	9, 667	774, 272	20	777	1, 253	395, 948	5, 162	1, 280, 176
1950	1, 199	189, 224	34	3, 623	12, 122	1, 090, 592	100	6, 537	944	254, 880	6, 591	1, 871, 844

[1] Based on Southwestern Missouri ore ("dirt") and old tailings treated at mills during the calendar year indicated.
[2] In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 10.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in Southwestern Missouri, 1949–50

	1949		1950	
	Crude ore	Old tailings and slimes	Crude ore	Old tailings and slimes
Total ore, etc., milled......short tons..	323, 967	8, 000	318, 383	10, 500
Total concentrate produced:				
Lead......do....	1, 587	1	1, 233	2
Zinc......do....	9, 591	96	12, 222	102
Ratio of concentrate to ore, etc.:				
Lead......percent..	0. 49	0. 01	0. 39	0. 02
Zinc......do....	2. 96	1. 20	3. 84	0. 97
Metal content of ore, etc.: [1]				
Lead......do....	0. 39	0. 01	0. 30	0. 02
Zinc......do....	1. 75	0. 61	2. 30	0. 55
Average lead content of galena concentrates......do....	80. 74	66. 00	78. 65	80. 00
Average lead content of lead carbonate......do....	57. 14	----------	55. 80	----------
Average zinc content of sphalerite concentrates......do....	59. 31	51. 04	60. 05	56. 86
Average zinc content of silicates and carbonates......do....	40. 00	----------	41. 00	----------
Average value per ton:				
Galena concentrates......	$216. 08	$150. 00	$157. 82	$198. 00
Lead carbonate concentrates......	$115. 57	----------	$106. 56	----------
Sphalerite concentrates......	$80. 38	$51. 86	$89. 97	$84. 48
Zinc silicates and carbonates......	$38. 85	----------	$65. 37	----------

[1] Figures represent metal content of crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

Southwestern Missouri.—Production of southwestern Missouri zinc, in terms of recoverable metal, amounted to 6,643 tons in 1950, an increase of about 28 percent over the 1949 production of 5,162 tons. Lead production, on the other hand, declined 25 percent, amounting to 946 tons of recoverable metal in 1950. The principal zinc producers in this region were Federal Mining & Smelting Co. operations at Duenweg, Dale Mining Co. at Stark City, Potter & Sims open-pit operations on the Snapp property, and A. G. Swartz at Joplin. There were numerous other producers in the region, accounting for the remainder of the tonnage.

OKLAHOMA

Oklahoma remained the largest producer of both zinc and lead in the Tri-State district in 1950 and accounted for 58 percent (46,739 tons) of the district's recoverable zinc and 67 percent (20,724 tons) of its recoverable lead. Zinc output was 6 percent greater than in 1949 and lead 4 percent greater.

TABLE 11.—Mine production of lead and zinc in Oklahoma, 1946–50, and total, 1891–1950, in terms of concentrate and recoverable metal [1]

Year	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Recoverable metal content [2]			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	17,847	$2,903,065	129,473	$15,170,928	13,697	$2,985,946	69,552	$16,970,688
1947	18,857	3,600,407	95,126	10,699,593	14,289	4,115,232	51,062	12,357,004
1948	22,638	5,214,366	82,734	7,178,960	16,918	6,056,644	43,821	11,656,386
1949	26,910	5,020,076	82,522	6,407,589	19,858	6,275,128	44,033	10,920,184
1950	27,261	4,218,880	87,116	8,247,342	20,724	5,595,480	46,739	13,273,876
1891–1950	1,545,566	139,452,985	9,214,670	434,747,039	1,190,580	166,103,391	4,856,889	694,739,148

[1] Based on Oklahoma ore ("dirt") and old tailings treated at mills during calendar year indicated.
[2] In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 12.—Tenor of lead and zinc ore, old tailings, and slimes milled and concentrates produced in Oklahoma, 1949–50

	1949		1950	
	Crude ore	Old tailings and slimes	Crude ore	Old tailings and slimes
Total ore, etc., milled ... short tons	2,543,835	1,050,586	2,850,880	855,681
Total concentrate produced:				
Galena ... do	26,884	26	27,216	45
Sphalerite ... do	77,262	5,260	83,541	3,575
Ratio of concentrate to ore, etc.:				
Lead ... percent	1.06	0.002	0.95	0.005
Zinc ... do	3.04	0.50	2.93	0.42
Metal content of ore, etc.: [1]				
Lead ... do	0.80	0.001	0.74	0.003
Zinc ... do	1.80	0.29	1.75	0.24
Average lead content of galena concentrates ... do	75.32	57.69	77.61	55.56
Average zinc content of sphalerite concentrates ... do	59.35	58.29	59.73	56.81
Average value per ton:				
Galena concentrates	$186.60	$138.08	$154.82	$118.40
Sphalerite concentrates	$76.82	$89.76	$95.06	$85.66

[1] Figures represent metal content of the crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

The five principal zinc producers of the State were Eagle-Picher Mining & Smelting Co., Nellie B. Mining Co., Federal Mining & Smelting Co., Sooner Milling Co., Inc., and the C. & M. Mining Co. The five principal lead producers were Eagle-Picher Mining & Smelting Co., Nellie B. Mining Co., Federal Mining & Smelting Co., W. M. & W. Mining Co., and Jake Dryer.

The Eagle-Picher Mining & Smelting Co. Central mill treated 2,802,281 tons of ore, the greater portion of which originated in Oklahoma. This 15,000-ton custom mill used its sink-float process for primary concentration of zinc and lead, followed by gravity and flotation for the final clean product. Company mines operating in Oklahoma during 1950 were Big Chief, Blue Goose Nos. 1 and 2, Buffalo, Crawfish, Crystal, Goodwin, Gordon No. 2, Grace Walker No. 2, Hum-bah-wat-tah Nos. 1 and 2, John Beaver No. 2, Kenoyer, Lottson No. 2, Netta, North Hunt, Piokee, Ramage, Royal, See Sah, Swift, Vantage, Wesah, White, Whitebird-Eudora, and Whitebird-Joseph. The principal Oklahoma custom shippers to the Central mill included Buffalo Mining Co. (Buffalo), Craig No. 1 Mining Co. (Craig), Mahutska Mining Co. (Jeff City, Eudora, and Mahutska), Frank Hudson (Bingham and Blackhawk), Sims Mining Co. (Pelican), and Wright & Dalton (Little Pat).

The Nellie B. Mining Co. was the second-largest producer in the State. The company operated its Rialto, Lawyers, and Barbara J. mines and mills throughout the year. The three mills are typical of the Tri-State area, using jigging, tables, and flotation methods to produce zinc and lead concentrates. Federal Mining & Smelting Co. was the third-largest producer during 1950, operating its Gordon and Lucky Syndicate-Howe-Ohimo mines and shipping to the Central mill.

Other companies operating custom mills were Harris Mining Co. (Farmington mine and Lucky Jenny mill), Scott Mining Co., Mission Mining Co., and C. & M. Mining Co.

Tailings-re-treatment operations included the Sooner Milling Co., Inc., and the Britt & Britt.

KANSAS

The Kansas zinc-lead mining areas are in the southeastern corner of the State, forming part of the Tri-State district and accounting, in 1950, for 34 percent of the zinc concentrates and 30 percent of the lead concentrates produced in the district. Kansas mines produced 8 percent less zinc concentrate and 6 percent less lead concentrate than in 1949. The Baxter Springs-Blue Mound-Treece areas accounted for 98 percent of the State 1950 production. Tailings-re-treatment operations dropped drastically in 1950, only 541 tons of zinc concentrates and 8 tons of lead concentrates being produced.

Eagle-Picher Mining & Smelting Co. was the largest producer of zinc and lead concentrates in Kansas, while National Lead Co., St. Louis Smelting & Refining Division, was next, followed by the C. K. & E. Mining Co. and the Bilharz Mining Co. Approximately 57 percent of the crude ore mined in the area was concentrated in the Central mill of the Eagle-Picher Mining & Smelting Co. at Cardin, Okla. Eagle-Picher operated the following company mines: Big John, Foley No. 3, Mullen, Webber, Westside No. 2, and Wilbur.

TABLE 13.—Mine production of lead and zinc in Kansas, 1946–50, and total, 1876–1950, in terms of concentrate and recoverable metal [1]

Year	Mines producing	Lead concentrates (galena)		Zinc concentrates (sphalerite)		Recoverable metal content [2]			
						Lead		Zinc	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1946	82	8,499	$1,388,210	87,963	$9,902,906	6,445	$1,405,010	47,703	$11,639,532
1947	79	9,569	1,811,269	76,699	7,641,709	7,285	2,098,080	41,497	10,042,274
1948	79	11,090	2,592,500	66,340	5,833,441	8,386	3,002,188	35,577	9,463,482
1949	70	12,973	2,463,056	54,969	4,262,380	9,772	3,087,952	29,433	7,299,384
1950	66	12,218	1,833,537	50,579	4,581,839	9,487	2,561,490	27,176	7,717,984
1876–1950	-------	784,101	62,490,685	5,166,000	235,059,758	598,497	75,386,499	2,681,147	367,936,032

[1] Based on Kansas ore ("dirt") and old tailings treated at mills during the calendar year indicated.
[2] In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 14.—Tenor of lead and zinc ore and old tailings milled and concentrates produced in Kansas, 1949–50

	1949		1950	
	Crude ore	Old tailings	Crude ore	Old tailings
Total ore and old tailings milled......short tons..	1,602,976	544,034	1,531,435	101,745
Total concentrate produced:				
Galena......do....	12,951	22	12,210	8
Sphalerite......do....	52,245	2,724	50,038	541
Ratio of concentrate to ore, etc.:				
Lead......percent..	0.81	0.004	0.80	0.008
Zinc......do....	3.26	0.50	3.27	0.53
Metal content of ore, etc.: [1]				
Lead......do....	0.62	0.002	0.63	0.005
Zinc......do....	1.94	0.29	1.95	0.31
Average lead content of galena concentrates......do....	76.87	57.58	79.22	57.58
Average zinc content of sphalerite concentrates......do....	59.59	57.64	59.71	57.80
Average value per ton:				
Galena concentrates......	$190.02	$95.55	$150.09	$117.25
Sphalerite concentrates......	$78.08	$67.21	$90.64	$85.92

[1] Figures represent metal content of the crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

The Walter Hartley mine of the National Lead Co., St. Louis Smelting & Refining Division, was the largest single producer in the State for the second consecutive year. Other company mines were the Moore, Estes, and Mount Hope School tract. The No. 8 (Ballard) mill treated this ore, as well as that from the Clark mine operated by the Little Ben Mining Co. and the Liza Jane mine operated by the Liza Jane Mining Co.

The Beck No. 3 mill, located west of Baxter Springs, treated ore from the MacArthur, Mason-Brewster, and Brewster No. 6 mines. The Dines Mining Co. mill at Blue Mound north of Picher, Okla., concentrated ores from the Stoskopf, Hartley No. 1, and Homestake mines. The Wade-Rea mill treated company ore and many small lots from outside shippers. The Robinson mill of the Fox Mining Co. treated company ore from the Fox mine. Barr Surface Cleanup Co., operating the old Webber mill, treated slimes from the Webber, Stoskopf, Mid-Continent, and Scott-Jarrett tracts.

Kansas shippers to the Eagle-Picher Central mill included Mark Twain Mining Co. on the Naylor land, Bob White Mining Co. on the Cherokee and Chubb, Bilharz Mining Co. on the Muncie, Linda Lou Mining Co. on the Northern, C. K. & E. Mining Co. on the Karcher and Stebbins tracts, and the Grace Jarrett Mining Co. on the Wright land.

Small production also occurred in the Galena and Waco district.

ARKANSAS

Mine operations in Arkansas during 1950 were limited to small, intermittent production and accounted for 9 tons of recoverable lead and 8 tons of recoverable zinc. This production originated around Harrison in Boone County and Ponca in Newton County.

Montana

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Almon F. Robertson and Virginia Halverson

GENERAL SUMMARY

MINE production of gold and copper in Montana decreased in 1950 compared with 1949. Gold output declined almost 2 percent and copper nearly 4 percent. Silver and lead outputs were, respectively, 4 and 9 percent higher. Zinc output advanced 25 percent to exceed copper production for the third time in Montana history. The total ore output increased about 39 percent, owing mainly to the mining of larger tonnages of special waste and dump material. The value of recoverable gold was almost 2 percent and lead nearly 7 percent less than in 1949; silver increased over 4 percent, copper nearly 2 percent, and zinc over 43 percent. The total value of the five metals increased from $49,003,447 in 1949 to $54,956,689 in 1950—over 12 percent. Gold accounted for approximately 3 percent, silver 11, copper 41, lead 10, and zinc 35 percent of the total value.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. The value of metal production has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1946–50 and total, 1862–1950, in terms of recoverable metal [1]

Year	Lode mines: Number of mines	Lode mines: Ore sold or treated (short tons)	Placer mines: Number of mines	Placer mines: Gravel washed (cubic yards)	Gold (lode and placer): Fine ounces	Gold (lode and placer): Value	Silver (lode and placer): Fine ounces	Silver (lode and placer): Value
1946	193	2,234,958	42	5,769,358	70,507	$2,467,745	3,273,140	$2,644,697
1947	243	3,100,013	54	6,093,609	90,124	3,154,340	6,326,190	5,725,202
1948	250	3,020,307	34	4,293,611	73,091	2,558,185	6,930,716	6,272,648
1949	281	2,595,934	48	3,023,372	52,724	1,845,340	6,327,025	5,726,277
1950	245	3,608,036	39	1,232,255	51,764	1,811,740	6,590,747	5,964,959
1862–1950	-------	(2)	-------	(2)	17,319,824	390,647,052	775,324,501	570,765,138

Year	Copper: Short tons	Copper: Value	Lead: Short tons	Lead: Value	Zinc: Short tons	Zinc: Value	Total value
1946	58,481	$18,947,844	8,280	$1,805,040	16,770	$4,091,880	$29,957,206
1947	57,900	24,318,000	16,108	4,639,104	45,679	11,054,318	48,890,964
1948	58,252	25,281,368	18,411	6,591,138	59,095	15,719,270	56,422,609
1949	56,611	22,304,734	17,996	5,686,736	54,195	13,440,360	49,003,447
1950	54,478	22,662,848	19,617	5,296,590	67,678	19,220,552	54,956,689
1862–1950	6,805,594	1,996,367,624	767,132	99,478,204	2,088,935	348,857,342	3,406,115,360

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, or copper precipitates shipped directly to smelters during the calendar year indicated.
[2] Figures not available.

TABLE 3.—Gold produced at placer mines in Montana, 1946–50, by class of mine and by method of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered: Fine ounces	Gold recovered: Value	Gold recovered: Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucket-line dredges:					
1946	4	4,621,073	21,609	$756,315	$0.164
1947	5	5,398,575	21,749	761,215	.141
1948	4	3,523,306	13,932	487,620	.138
1949	2	2,604,905	7,758	271,530	.104
1950	1	1,128,902	2,946	103,110	.091
Dragline dredges:					
1946	4	808,100	4,706	164,710	.204
1947	3	478,194	2,329	81,515	.170
1948	3	57,850	299	10,465	.181
1949–50	--------	--------	--------	--------	--------
Becker-Hopkins dredges:					
1946 [1]	1	5,000	32	1,120	.224
1947–50	--------	--------	--------	--------	--------
Nonfloating washing plants: [2]					
1946	2	320,000	1,354	47,390	.148
1947	6	185,050	2,883	100,905	.545
1948	8	707,700	2,177	76,195	.108
1949	13	409,545	1,855	64,925	.159
1950	6	93,048	287	10,045	.108
Gravel hydraulically handled:					
Hydraulic:					
1946	6	6,950	87	3,045	.438
1947	1	15,680	195	6,825	.435
1948	1	750	48	1,680	2.240
1949	2	1,500	53	1,855	1.237
1950	1	500	13	455	.910

For footnotes, see end of table.

TABLE 3.—Gold produced at placer mines in Montana, 1946–50, by class of mine and by method of recovery—Continued

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers—Continued					
Small-scale hand methods:					
Wet:					
1946	23	5,695	96	$3,360	$0.590
1947	37	13,795	155	5,425	.393
1948	16	3,805	66	2,310	.607
1949	29	7,395	152	5,320	.719
1950	29	9,765	182	6,370	.652
Underground placers:					
Drift:					
1946	2	2,540	102	3,570	1.406
1947	2	2,315	123	4,305	1.860
1948	2	200	19	665	3.325
1949	2	27	3	105	3.889
1950	2	40	6	210	5.250
Grand total placers:					
1946	42	5,769,358	27,986	979,510	.170
1947	54	6,093,609	27,434	960,190	.158
1948	34	4,293,611	16,541	578,935	.135
1949	48	3,023,372	9,821	343,735	.114
1950	39	1,232,255	3,434	120,190	.098

[1] First year for which this method was reported used in Montana.
[2] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

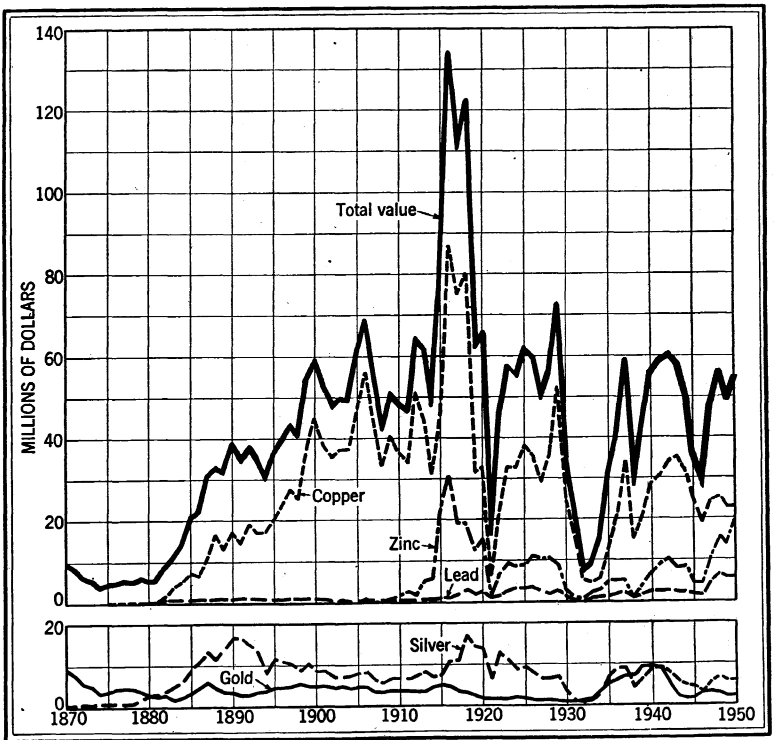

FIGURE 1.—Value of mine production of gold, silver, copper, lead, and zinc, and total value in Montana 1870–1950.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	4,791	533,160	5,246	1,298	4,267
February	4,530	511,499	4,380	1,285	3,946
March	4,379	547,160	5,701	1,098	3,692
April	4,764	540,406	5,554	1,350	4,163
May	3,328	469,161	3,816	1,393	4,747
June	5,180	484,782	3,629	1,665	5,213
July	5,064	572,385	4,036	1,778	6,202
August	4,618	633,360	4,156	2,068	6,717
September	3,612	528,907	3,824	1,820	6,583
October	3,678	581,160	4,591	1,958	7,517
November	3,882	591,606	4,714	1,925	7,313
December	3,938	597,161	4,831	1,979	7,318
Total: 1950	51,764	6,590,747	54,478	19,617	67,678
1949	52,724	6,327,025	56,611	17,996	54,195

Gold.—Montana's output of gold decreased slightly in 1950 owing to a sharp drop in production from placer operations in Granite and Lewis and Clark Counties which more than offset a gain in output from zinc and lead operations at Butte. Gold production from dredging operations declined 4,812 ounces from the 1949 output, a drop of 62 percent. Of the State gold in 1950, 47 percent was derived from gold and silver ores (49 percent in 1949), nearly 47 percent from base metal ores (32 percent in 1949), and over 6 percent from placers (19 percent in 1949). Ores milled yielded 68 percent of the total gold and ores shipped to smelters nearly 25 percent.

Gold producers in Montana with an output of 1,300 ounces or more in 1950 were the properties of the Anaconda Copper Mining Co. (copper ore and waste materials and zinc-lead ore and dumps) at Butte; the Estelle mine of the McLaren Gold Mines Co. in Park County (gold ore), the Drumlummon mine of the Montana Rainbow Mining Co. (gold ore), and the Last Chance Gulch Placer of the Porter Bros. Corp., both in Lewis and Clark County; the Ruby group of the Ruby Gulch Mining Co. in Phillips County (gold ore); the Cornucopia mine in Madison County (gold-silver ore); and the American Pit (Victoria) mine of the Victoria Mines, Inc., in Madison County (gold ore). From these seven properties came 80 percent of the State total gold in 1950.

Silver.—Production of silver increased slightly in 1950, as output from zinc-lead ore mined at the Butte Hill properties of the Anaconda Copper Mining Co. more than offset the loss of silver from copper ore mined from the same area. In 1950 the company-owned Butte Hill operations of the Anaconda Copper Mining Co. supplied 87 percent of the State total silver output. Other important silver producers in 1950, in order of decreasing outputs, were the Emma mine at Butte, the Travona mine in Silver Bow County, the Cornucopia mine in Madison County, and the Mike Horse mine at Flesher in Lewis and Clark County. These five operations furnished 93 percent of the State silver production in 1950.

Zinc-lead ore supplied 68 percent of the State silver in 1950, copper ore 26 percent, gold and silver ores over 4 percent, and lead ore and zinc ore and old slag together over 1 percent. Ores milled yielded 94 percent of the total silver and smelting ores almost 6 percent; minor sources were placers and old lead-smelter slag fumed.

Copper.—An inadequate supply of mine labor and a fire in the Leonard mine caused a decline in copper output at the Anaconda Copper Mining Co., the State's only large producer. The company contributed over 98 percent of the State copper output in 1950.

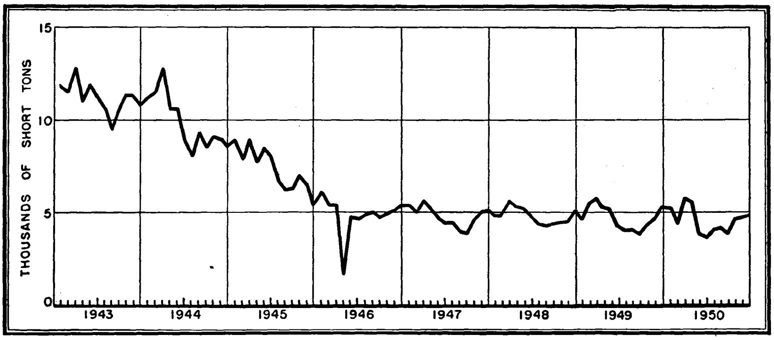

FIGURE 2.—Mine production of copper in Montana, 1943–50, by months, in terms of recoverable metal.

Lead.—Montana's production of recoverable lead in 1950 increased 9 percent owing to a substantial gain in output of zinc-lead ore from the Butte Hill mines and dumps of the Anaconda Copper Mining Co. Anaconda company-owned operations in 1950 supplied 69 percent of the State lead; other operations that produced over a million pounds of recoverable lead each were the Emma mine, the Mike Horse property, and the Jack Waite mine in Sanders County. These four supplied 86 percent of the total lead produced in the State. Of the latter total, 90 percent was recovered from zinc-lead ore, 7 percent from lead ore, 2 percent from gold and silver ores, and 1 percent from zinc ore and old slag.

Zinc.—As a result of record output at the Butte Hill mines and dumps of the Anaconda Copper Mining Co., Montana zinc production in 1950 increased 25 percent and for the third year in the State's history exceeded copper in output. During the year Anaconda company-owned operations at Butte supplied 79 percent of the State zinc output. Other important zinc producers, each with an output exceeding a million pounds of recoverable zinc, were the Emma mine, East Helena old slag dump, the Travona mine in Silver Bow County, and the Mike Horse property. These five operations produced 99 percent of the State total zinc output. Zinc-lead ore supplied 96 percent of the State zinc in 1950, and zinc ore and old slag nearly 4 percent; the remainder came from gold, silver, lead, and copper ores.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Beaverhead	32		1,705	$59,675	61,970	$56,086
Broadwater	22	5	1,405	49,175	6,594	5,968
Cascade	4		64	2,240	36,199	32,762
Deer Lodge	3		624	21,840	2,044	1,850
Fergus	1	1	10	350	63	57
Flathead	1		2	70	95	86
Granite	13	2	873	30,555	25,341	22,935
Jefferson	41		1,410	49,350	96,535	87,369
Judith Basin	4		19	665	6,003	5,433
Lewis and Clark	26	12	8,819	308,665	87,341	79,048
Lincoln	3	2	83	2,905	789	714
Madison	44	3	4,560	159,600	85,424	77,313
Meagher	3	3	5	175	294	266
Mineral	3	3	59	2,065	13,639	12,344
Missoula	4	1	12	420	1,422	1,287
Park	9	1	6,710	234,850	22,781	20,618
Phillips	2		1,933	67,655	9,248	8,370
Powell	7	2	233	8,155	2,316	2,096
Ravalli	2	1	56	1,960		
Sanders	3		19	665	9,100	8,236
Silver Bow	18	3	23,163	810,705	6,123,549	5,542,121
Total: 1950	245	39	51,764	1,811,740	6,590,747	5,964,959
1949	281	48	52,724	1,845,340	6,327,025	5,726,277

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Beaverhead	25,600	$5,325	1,001,800	$135,243	114,400	$16,245	$272,574
Broadwater	2,000	416	66,000	8,910	62,500	8,875	73,344
Cascade	3,200	666	289,400	39,069	284,000	40,328	115,065
Deer Lodge	24,700	5,138	1,400	189	1,500	213	29,230
Fergus			1,000	135	2,000	284	826
Flathead	400	83					239
Granite	9,900	2,059	53,000	7,155	244,100	34,662	97,366
Jefferson	24,200	5,034	779,800	105,273	368,800	52,370	299,396
Judith Basin	900	187	119,600	16,146	43,900	6,234	28,665
Lewis and Clark	79,300	16,494	2,462,000	332,370	6,585,600	935,155	1,671,732
Lincoln	500	104	15,800	2,133	500	71	5,927
Madison	355,100	73,861	156,000	21,060	19,000	2,698	334,532
Meagher			8,000	1,080	2,000	284	1,805
Mineral	10,700	2,226	94,600	12,771	232,000	32,944	62,350
Missoula	600	125	674,200	91,017	5,500	781	93,630
Park	567,400	118,019	111,000	14,985	13,000	1,846	390,318
Phillips	100	21	200	27	200	28	76,101
Powell	43,400	9,027	12,000	1,620	2,100	298	21,196
Ravalli	400	83					2,043
Sanders	14,300	2,974	2,029,400	273,969	353,900	50,254	336,098
Silver Bow	107,793,300	22,421,006	31,358,800	4,233,438	127,021,000	18,036,982	51,044,252
Total: 1950	108,956,000	22,662,848	39,234,000	5,296,590	135,356,000	19,220,552	54,956,689
1949	113,222,000	22,304,734	35,992,000	5,686,736	108,390,000	13,440,360	49,003,447

MINING INDUSTRY

Active lode mines in Montana decreased 13 percent from 281 in 1949 to 245 in 1950; active placer mines dropped 19 percent from 48 to 39. At the Butte properties of the Anaconda Copper Mining Co., preparation of mine and surface facilities for the Greater Butte project continued throughout the year. Construction of the main hoist house at the Kelley Shaft site and other necessary facilities, including installation of a 7,500-ton steel railroad ore bin, was completed during the year. Work on other portions of the project proceeded on schedule, and actual extraction of ore is expected to begin early in 1952.

The production of zinc-lead and lead ores increased 96 and 16 percent, respectively, in the State in 1950, but copper ore mined declined 3 percent owing largely to a fire in the Anaconda Copper Mining Co. Leonard mine at Butte. Of the 3,608,036 tons of ore treated during the year (2,595,934 in 1949), 63 percent was zinc-lead, lead, and zinc ores (46 percent in 1949), 33 percent copper ore (47 percent in 1949), and 4 percent gold and silver ores (7 percent in 1949).

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	82	101,985	20,747	77,595	951,746	55,579	50,692
Dry gold-silver ore	38	19,061	3,071	98,228	20,170	358,741	103,833
Dry silver ore	41	12,729	332	110,081	22,076	327,920	298,920
Total	161	133,775	24,150	285,904	993,992	742,240	453,445
Copper	11	1,192,789	3,708	1,729,611	[2] 101,254,164		41
Lead	67	24,710	908	60,389	39,150	2,782,773	233,415
Zinc	3	[3] 20,945		21,987	909	510,013	4,771,990
Zinc-lead	27	2,235,817	19,564	4,492,529	6,667,785	35,198,974	129,897,109
Total lode mines	245	3,608,036	48,330	6,590,420	[2] 108,956,000	39,234,000	135,356,000
Gravel (placer operations)	39		3,434	327			
Total: 1950	284	3,608,036	51,764	6,590,747	[2] 108,956,000	39,234,000	135,356,000
1949	329	2,595,934	52,724	6,327,025	[4] 113,222,000	35,992,000	108,390,000

[1] Detail will not add to totals because some mines produce more than 1 class of ore.
[2] Includes 6,656,414 pounds recovered from precipitates.
[3] Includes 20,764 tons of lead-smelter slag fumed.
[4] Includes 4,419,019 pounds recovered from precipitates.

METALLURGICAL INDUSTRY

The 3,608,036 tons of ore produced from Montana lode mines in 1950 were treated as follows: 3,497,032 tons (97 percent) at mills (2,464,870 tons in 1949), 90,240 tons (2 percent) shipped to smelters (116,479 tons in 1949) and 20,764 tons (1 percent) of old lead-smelter slag fumed (14,585 tons in 1949).

The Anaconda Copper Mining Co. copper concentrator, zinc concentrator, and copper smelter (all at Anaconda) and the two electrolytic zinc plants (at Anaconda and Great Falls) operated throughout the year. The zinc plants treated 466,695 tons of zinc concentrates from many sources containing 494,909,180 pounds of zinc compared with 480,923 tons (revised figure) containing 507,592,850 pounds of zinc in 1949. The company slag-fuming plant at East Helena was operated throughout the year and treated 222,892 tons of hot slag and old cold slag, compared with 222,875 tons in 1949; output of zinc-lead fume increased from 36,827 tons in 1949 to 37,754 tons in 1950.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	3,434	327			
Amalgamation	2,003	4,093			
Cyanidation	1,971	5,720			
Smelting of ore	12,844	390,906	1,571,880	2,951,154	793,670
Smelting of concentrate [1]	31,512	6,180,777	100,727,706	35,779,354	129,851,009
Smelting of precipitates (copper)			6,656,414		
Smelting of old slag		8,924		503,492	4,711,321
Total: 1950	51,764	6,590,747	108,956,000	39,234,000	135,356,000
1949	52,724	6,327,025	113,222,000	35,992,000	108,390,000

[1] Includes zinc concentrates treated at electrolytic plants.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore and old tailings treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Broadwater	1,225	126	10	28	43	535	153	9,680	2,399
Cascade	6,460			542	63	35,604	2,933	286,913	283,183
Deer Lodge	830	327	27						
Granite	6,975			641	490	22,253	6,900	43,200	239,900
Jefferson	650	203	163	13	16	317	95	2,911	1,813
Lewis and Clark	27,840	1,144	728	3,029	509	43,437	65,704	1,864,195	1,788,357
Lincoln	260	28		20	51	789	500	15,800	500
Madison	27,255	2		2,462	1,389	9,319	344,152	3,051	315
Mineral	6,682			294	29	13,639	10,700	94,600	232,000
Missoula	16,560			668		1,412	600	674,200	5,500
Park	32,400	210	3,303	2,287	6,338	15,824	565,971	5,042	1,277
Phillips	13,900	1,906	5,582						
Powell	200			10	2	360	562	4,542	750
Ravalli	60	28							
Sanders	6,778			1,261	14	6,804	12,095	1,464,400	317,765
Silver Bow	3,348,957			484,854	22,568	6,030,484	[1]106,373,755	31,310,820	126,977,250
Total: 1950	3,497,032	3,974	9,813	496,109	31,512	6,180,777	[1]107,384,120	35,779,354	129,851,009
1949	2,464,870	6,808	14,030	451,600	24,613	5,763,802	[1]110,717,145	30,312,039	101,306,995
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS									
Dry gold				246	498	202			
Dry gold-silver				25	443	6,383	1,204	3,395	3,857
Copper				210,877	10,519	1,636,218	[1] 99,318,024		
Lead				24,089	6,204	1,542,131	2,665,996	24,168,092	3,339,840
Zinc				133,236	11,615	2,653,047	3,532,034	9,764,392	121,226,954
Zinc-lead				22	5	1,372	107	5,947	3,412
Dry iron (from copper, zinc-lead ore)				127,614	2,228	341,424	1,866,755	1,837,528	5,276,946
Total: 1950				496,109	31,512	6,180,777	[1]107,384,120	35,779,354	129,851,009

For footnote, see end of table.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal—Continued

B. For ore and old tailings shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaverhead	6,630	1,705	61,970	25,600	1,001,800	114,400
Broadwater	1,446	1,197	6,049	1,847	56,320	60,101
Cascade	16	1	595	267	2,487	817
Deer Lodge	880	297	2,017	24,700	1,400	1,500
Fergus	5	-----	63	-----	1,000	2,000
Flathead	48	2	95	400	-----	-----
Granite	581	327	3,077	3,000	9,800	4,200
Jefferson	17,856	1,191	96,055	24,105	776,889	366,987
Judith Basin	226	19	6,003	900	119,600	43,900
Lewis and Clark	11,500	4,000	33,946	13,596	94,313	85,922
Madison	10,938	3,161	76,105	10,948	152,949	18,685
Meagher	51	-----	294	-----	8,000	2,000
Missoula	13	10	10	-----	-----	-----
Park	252	158	3,654	1,429	105,958	11,723
Phillips	55	27	3,666	100	200	200
Powell	996	210	1,956	42,838	7,458	1,350
Ravalli	6	-----	-----	400	-----	-----
Sanders	428	5	2,296	2,205	565,000	36,135
Silver Bow	38,313	534	93,055	1,419,545	47,980	43,750
Total: 1950	90,240	12,844	390,906	1,571,880	2,951,154	793,670
1949	116,479	11,478	542,345	2,502,695	5,359,766	4,158,877
BY CLASS OF MATERIAL						
Dry gold	16,209	8,041	35,949	39,929	42,197	46,180
Dry gold-silver	17,861	3,031	97,156	19,407	342,139	98,971
Dry silver	12,629	330	108,887	22,017	324,353	297,221
Copper	36,189	520	78,766	1,457,863	-----	41
Lead	6,840	883	48,896	29,793	2,062,536	220,578
Zinc	181	-----	13,063	909	6,521	60,669
Zinc-lead	331	39	8,189	1,962	173,408	70,010
Total: 1950	90,240	12,844	390,906	1,571,880	2,951,154	793,670

[1] Includes copper recovered from mine-water precipitates as follows: 1950, 6,656,414 pounds; 1949, 4,419,019 pounds.

The program for expansion of the Anaconda Copper Mining Co. zinc concentrator at Anaconda from 2,000 tons to 4,000 tons per day was completed in October 1950. Remodeling of four sections of the copper concentrator to accommodate ore coming from the Greater Butte project progressed during the year, with completion anticipated by the end of 1951.

The lead smelter of the American Smelting & Refining Co. at East Helena operated throughout 1950 and treated chiefly lead-silver concentrates from mines in Idaho and Washington, residues from the electrolytic zinc plants at Anaconda and Great Falls, and crude ore, concentrates, and old tailings from numerous districts in Montana.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE AND OLD TAILINGS TREATED AT MILLS						
Dry gold	85,776	15,577	69,538	964,350	16,600	7,100
Dry gold-silver	1,200	50	1,425	1,150	18,400	8,000
Dry silver	100	4	1,500	150	5,000	2,200
Copper	1,156,600	3,950	1,706,589	102,252,165		
Lead	17,870	37	12,980	13,500	856,455	17,950
Zinc-lead	2,235,486	29,199	5,596,499	9,595,241	43,697,660	154,645,633
Total: 1950	3,497,032	48,817	7,388,531	112,826,556	44,594,115	154,680,883
1949	2,464,870	41,196	6,860,329	114,985,538	36,632,011	118,748,713
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	246	498	202			
Dry gold-silver	25	443	6,383	1,416	3,421	4,647
Copper	210,877	10,519	1,636,218	98,452,923		
Lead	24,089	6,204	1,542,131	3,136,617	24,585,908	4,025,034
Zinc	133,236	11,615	2,653,047	3,709,427	10,264,154	130,211,470
Zinc-lead	22	5	1,372	125	6,065	4,100
Dry iron (from copper, zinc-lead ore)	127,614	2,228	341,424	2,008,569	1,914,320	6,597,811
Total: 1950	496,109	31,512	6,180,777	107,309,077	36,773,868	140,843,062
1949	451,600	24,613	5,764,075	114,522,758	32,988,093	111,303,867
ORE AND OLD TAILINGS SHIPPED DIRECTLY TO SMELTERS						
Dry gold	16,209	8,041	35,949	43,250	42,965	55,744
Dry gold-silver	17,861	3,031	97,156	21,814	348,177	119,335
Dry silver	12,629	330	108,887	24,937	330,608	358,060
Copper	36,189	520	78,766	1,548,673		67
Lead	6,840	883	48,896	35,227	2,098,726	265,579
Zinc	181		13,063	1,084	6,672	67,800
Zinc-lead	331	39	8,189	2,295	176,235	84,107
Total: 1950	90,240	12,844	390,906	1,677,280	3,003,383	950,692
1949	116,479	11,478	542,345	2,609,032	5,465,043	5,180,906

REVIEW BY COUNTIES AND DISTRICTS

BEAVERHEAD COUNTY

Argenta District.—A total of 3,640 tons of lead ore was shipped to a smelter during 1950 by operators working the Maulden mine. The Shafer group of claims was worked by Shafer Bros. and lessees; 1,234 tons of gold ore were shipped to smelters. The Eight Ball mine, owned by the W. E. Stinson Estate, was operated during part of the year, and a total of 259 tons of gold smelting ore was shipped. R. M. Fleming worked the Jack (Trader Horn) mine through May 15 and shipped 251 tons of lead smelting ore containing 232 ounces of gold, 5,296 ounces of silver, 684 pounds of copper, 59,136 pounds of lead, and 3,336 pounds of zinc. Several shipments of gold-silver smelting ore were also made from the Jack property. Remaining district production was principally lead ore from a number of small properties operated intermittently during the year.

Chinatown District.—A total of 78 tons of lead smelting ore was shipped from the H & S mine.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Beaverhead County:													
Argenta	23		5,893	1,679		1,679	46,951		46,951	24,100	944,800	108,800	$249,269
Blue Wing	1		19	1		1	990		990				931
Chinatown	1		78	2		2	1,010		1,010	100	51,400	2,600	8,313
Medicine Lodge	1		9				22		22		4,800	2,500	1,023
Vipond	6		631	23		23	12,997		12,997	1,400	800	500	13,038
Broadwater County:													
Backer	2	5	154	64	39	103	53		53				3,653
Beaver	9		1,023	192		192	1,496		1,496	400	25,200	6,300	12,454
Cedar Plains	6		340	43		43	2,602		2,602	900	6,200	51,100	12,140
Park or Indian Creek	5		1,154	1,067		1,067	2,443		2,443	700	34,600	5,100	45,097
Cascade County: Montana	4		6,476	64		64	36,199		36,199	3,200	289,400	284,000	115,065
Deer Lodge County:													
Georgetown	2		1,699	624		624	1,864		1,864	24,600			28,644
Silver Lake	1		11				180		180	100	1,400	1,500	586
Fergus County: Warm Springs	1	1	5		10	10	63		63		1,000	2,000	826
Flathead County: Hog Heaven	1		48	2		2	95		95	400			239
Granite County:													
Alps	2		6,003	424		424	73		73		200	100	14,947
Boulder and South Boulder	4		339	181		181	2,223		2,223	700	9,400	4,100	10,344
First Chance	3		208	105		105	74		74	2,000			4,158
Flint Creek	2		885	26		26	22,528		22,528	6,900	43,200	239,900	62,632
Gold Creek and South Gold Creek		2			56	56		11	11				1,970
Henderson	1		53	1		1	421		421	300	200		505
Stony	1		68	80		80	11		11				2,810
Jefferson County:													
Amazon	1		3				42		42		400	100	106
Boulder and Little Boulder	2		126	7		7	400		400	500	5,800	3,300	1,963
Cataract	6		927	81		81	5,402		5,402	2,000	16,600	26,200	14,101
Clancy and Lump Gulch	4		1,793	2		2	22,096		22,096	1,300	18,800	50,100	29,990
Colorado	8		9,503	517		517	39,727		39,727	13,600	529,600	112,300	144,322
Elkhorn	3		2,937	98		98	24,140		24,140	4,200	84,200	154,500	59,458
Golconda	2		516	73		73	336		336	100	6,800	4,800	4,480
Lowland	2		511	25		25	2,792		2,792	500	3,400	300	4,008
Mitchell Gulch	1		6	2		2	10		10				79
Warm Springs	2		59	4		4	85		85	100	200	500	336
Whitehall	9		2,051	395		395	1,295		1,295	1,800	113,000	16,600	32,983
Wilson and Ticer Creek	1		74	206		206	210		210	100	1,000	100	7,570
Judith Basin County:													
Barker	3		201	8		8	5,929		5,929	900	119,600	43,900	28,213
Yogo	1		25	11		11	74		74				452

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Montana in 1950, by counties and districts, in terms of recoverable metal—Continued

County and district	Mines producing		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Lewis and Clark County:													
Greenhorn	-------	1	-------	-------	2	2	-------	-------	-------	-------	-------	-------	$70
Heddleston	1	-------	23,634	40	-------	40	36,915	-------	36,915	64,500	1,860,800	1,784,500	552,833
Helena	4	8	55	11	3,126	3,137	32	306	338	100	1,400	2,300	110,638
Lincoln (Poorman and McClellan Creeks)	-------	1	-------	-------	23	23	-------	-------	-------	-------	-------	-------	805
Madison Gulch	1	-------	123	6	-------	6	-------	-------	-------	-------	-------	-------	210
Marysville	3	-------	13,912	5,358	-------	5,358	32,217	-------	32,217	11,100	3,600	46,400	226,072
Missouri River	-------	1	-------	-------	12	12	-------	-------	-------	-------	-------	-------	420
Rimini	9	1	864	155	3	158	7,499	-------	7,499	2,400	69,200	32,700	26,801
Scratch Gravel	3	-------	470	44	-------	44	652	-------	652	300	5,600	4,400	3,573
Smelter	1	-------	20,783	3	-------	3	9,542	-------	9,542	500	521,000	4,715,200	748,738
Stemple-Gould	4	-------	263	36	-------	36	178	-------	178	400	400	100	1,572
Lincoln County:													
Libby	-------	2	-------	-------	4	4	-------	-------	-------	-------	-------	-------	140
Sylvanite	2	-------	160	51	-------	51	789	-------	789	500	15,800	500	4,807
West Fisher Creek	1	-------	100	28	-------	28	-------	-------	-------	-------	-------	-------	980
Madison County:													
Cherry Creek	1	-------	8	6	-------	6	116	-------	116	-------	-------	-------	315
McCarthy Mountains	4	-------	184	6	-------	6	1,116	-------	1,116	400	40,400	2,300	7,084
Norris and Norwegian	4	1	88	116	3	119	264	-------	264	100	200	400	4,509
Pony and South Boulder	2	-------	47	21	-------	21	95	-------	95	200	-------	-------	863
Renova (Bone Basin)	2	-------	137	48	-------	48	52	-------	52	-------	1,000	200	1,890
Rochester	10	-------	591	375	-------	375	2,222	-------	2,222	1,500	87,200	9,900	28,626
Sheridan	7	-------	721	46	-------	46	5,329	-------	5,329	500	6,000	3,700	7,872
Silver Star	3	-------	27,050	1,458	-------	1,458	9,816	-------	9,816	344,700	7,800	300	132,708
Tidal Wave	3	1	312	85	2	87	147	-------	147	6,300	-------	-------	4,488
Virginia City	8	1	9,055	2,391	3	2,394	66,267	-------	66,267	1,400	13,400	2,200	146,177
Meagher County:													
Beaver and Thomas Creek	-------	3	-------	-------	5	5	-------	-------	-------	-------		-------	175
Castle Mountain	3	-------	51	-------	-------	-------	294	-------	294	-------	8,000	2,000	1,630
Mineral County:													
Cedar and Trout Creeks	-------	2	-------	-------	15	15	-------	-------	-------	-------		-------	525
East Hunter	1	-------	3,482	2	-------	2	1,053	-------	1,053	1,700	33,000	145,600	26,507
Iron Mountain (Superior)	1	1	2,000	2	15	17	3,328	-------	3,328	300	30,000	80,600	19,164
Keystone	1	-------	1,200	25	-------	25	9,258	-------	9,258	8,700	31,600	5,800	16,154
Missoula County:													
Coloma (Garnet)	3	-------	13	10	-------	10	10	-------	10	-------	-------	-------	359
Copper Cliff (Cramer Creek)	1	-------	16,560	-------	-------	-------	1,412	-------	1,412	600	674,200	5,500	93,201
Elk Creek	-------	1	-------	-------	2	2	-------	-------	-------	-------	-------	-------	70

Park County:													
Emigrant Creek	-	1	-	-	4	4	-	-	-	-	-	-	140
New World	9	-	32,652	6,706	-	6,706	22,781	-	22,781	567,400	111,000	13,000	390,178
Phillips County: Little Rockies	2	-	13,955	1,933	-	1,933	9,248	-	9,248	100	200	200	76,101
Powell County:													
Finn (Washington Gulch)	-	1	-	-	7	7	-	-	-	-	-	-	245
Nigger Hill	3	-	404	51	-	51	1,032	-	1,032	800	11,000	1,400	4,569
Ophir Gulch	1	1	488	98	14	112	337	-	337	36,500	-	-	11,817
Zozell	3	-	304	63	-	63	947	-	947	6,100	1,000	700	4,565
Ravalli County: Overwich (Hughes Creek)	2	1	66	28	28	56	-	-	-	400	-	-	2,043
Sanders County:													
Eagle	1	-	7,198	19	-	19	8,932	-	8,932	14,000	2,026,800	352,900	335,391
Thompson River	2	-	8	-	-	-	168	-	168	300	2,600	1,000	707
Silver Bow County:													
Highland	-	3	-	-	61	61	-	10	10	-		-	2,144
Melrose	1	-	172	10	-	10	2,275	-	2,275	-	-	-	2,409
Summit Valley (Butte)	17	-	3,387,098	23,092	-	23,092	6,121,264	-	6,121,264	107,793,300	31,358,800	127,021,000	51,039,699
Total Montana	245	39	3,608,036	48,330	3,434	51,764	6,590,420	327	6,590,747	108,956,000	39,234,000	135,356,000	54,956,689

Medicine Lodge District.—Peter Sweeney operated his Owl Claims, Nos. 1 and 2 during the latter part of 1950 and shipped 9 tons of zinc-lead smelting ore containing 22 ounces of silver, 4,819 pounds of lead, and 3,083 pounds of zinc.

Vipond District.—Kathryn V. Bush and Geo. E. Hubbard operated the Monte Cristo mine during most of the year and shipped 236 tons of silver smelting ore. The Emma mine was operated during the last half of 1950 by J. R. Halverson, who recovered 166 tons of silver smelting ore containing 6,930 ounces of silver. Lessees worked the Quartz Hill Mines and shipped 149 tons of silver smelting ore containing 1,482 ounces of silver. Remaining district production, mostly from gold and silver ore, came from the G & W Moonlight 1 and 2, and Moosehorn Mining Co. properties.

BROADWATER COUNTY

Backer District.—The entire output was gold ore—78 tons from the Satellite mine and 76 tons from the Superior property.

Beaver District.—H. W. Carver operated the East Pacific group most of 1950 and produced 900 tons of gold-silver ore, which was treated in a 50-ton gravity mill on the property. In addition, 28 tons of zinc-lead ore was shipped to a smelter. Other district production was mainly gold smelting ore recovered at 6 mines operated intermittently during the year.

Cedar Plains District.—The principal output was 108 tons of zinc smelting ore produced by Roy E. Nicolls, owner and operator of the North Star group, and 114 tons of silver smelting ore from the Spar mine.

Park or Indian Creek District.—Dance & Anders operated the Marietta mine throughout 1950 and shipped gold smelting ore. William Zimmerman continued to work the Silver Wave mine and shipped 481 tons of gold smelting ore containing 83 ounces of gold, 676 ounces of silver, 925 pounds of copper, 32,095 pounds of lead and 5,555 pounds of zinc. Other properties in the district that recorded production during the year were the Coster, Diamond Hill, and Lookout.

CASCADE COUNTY

Montana District.—Lewis B. Stark operated the Galt and Equator mines and the Star mill continuously throughout 1950 and produced zinc-lead ore, which yielded 289 tons of lead concentrate and 241 tons of zinc concentrate. Small quantities of ore were shipped by lessees from the Lexington mine dump, the Hartley mine, and the Gone By claim.

DEER LODGE COUNTY

Georgetown District.—Gold ore comprised the bulk of the district output in 1950. The Acme Co. worked the Gold Coin mine continuously during the year and amalgamated 830 tons of gold ore. The Pyrenees Development Co. mined the Pyrenees property until August and shipped 869 tons of gold smelting ore containing 297 ounces of gold, 1,837 ounces of silver, and 25,408 pounds of copper.

GRANITE COUNTY

Alps District.—The principal district output came from the Alps group, operated by the Alps Mining & Milling Co. until October 1950, when the property was shut down for lack of ore reserve.

Boulder and South Boulder District.—As in 1949, silver ore comprised the bulk of lode production, 112 tons of which came from the Non-Pareil claim, 59 tons from the Moonlight (Annie) group, and 41 tons from the Princeton group. Operators on the Gold King mine shipped 127 tons of gold ore to a smelter.

First Chance District.—District output was entirely from gold ore, 63 tons of which were shipped to a smelter from the Gold Leaf property and 45 tons from the Sunrise mine. One hundred tons of gold ore from the Mitchell-Mussigbrod group were milled.

Flint Creek District.—The Taylor-Knapp Co. operated the Moorlight group throughout 1950 and milled 22,249 tons of manganese ore, containing varied amounts of gold, silver, copper, lead and zinc, in its 100-ton gravity and magnetic separation plant. Lead, zinc and iron concentrates totaling 40 tons, 194 tons, and 168 tons, respectively, were recovered from 875 tons of middling concentrate shipped to a custom mill.

Stony District.—A total of 68 tons of gold ore, recovered during development at the Moose Trail property, was shipped to a smelter.

JEFFERSON COUNTY

Boulder and Little Boulder District.—The bulk of the district output was recovered from 121 tons of dump ore shipped from the Boulder Mill & Smelter dump.

Cataract District.—Seven Consolidated Gold Mines operated the Josephine mine and produced gold-silver ore containing 32 ounces of gold, 639 ounces of silver, 321 pounds of copper, 370 pounds of lead, and 320 pounds of zinc. Harold J. Guilio operated the Comet mine and shipped 576 tons of silver smelting ore. Other properties in the district that reported small production during the year were the Golden Thread Placer, Hope & Bullion, Inc., Morning Glory, and Silver Hill.

Clancy and Lump Gulch District.—Principal production from the district during 1950 was 1,703 tons of silver dump ore from the Liverpool dump, which yielded 8,299 ounces of silver, 1,345 pounds of copper, 10,605 pounds of lead, and 45,465 pounds of zinc.

Colorado District.—Most of the district output in 1950 comprised 3,641 tons of dump material from the Alta dump, 2,059 tons of gold-silver smelting ore from the Custer dump, 3,059 tons of gold-silver smelting ore from the Gregory Mines dump, and 123 tons of gold-silver smelting ore from the Minah dump. Crenshaw, Boutinen & Smith worked the Mount Washington mine from April 1 to June 15, 1950, and shipped 547 tons of gold-silver smelting ore containing 51 ounces of gold, 2,355 ounces of silver, 1,117 pounds of copper, 45,292 pounds of lead, and 11,440 pounds of zinc.

Elkhorn District.—Production for the year was derived from 798 tons of silver ore from the Elkhorn mine, 1,656 tons of old silver tailings from the Elkhorn dump, and 483 tons of gold-silver ore from the Elkhorn Queen dump.

Golconda District.—The Golconda Mining Co. operated the Buckeye (Gold Coin) group 1 month of the year and treated 500 tons of gold ore in the company 80-ton cyanide plant. A small tonnage of zinc-lead smelting ore was shipped during the early part of 1950 from the Big Chief & Kodiak claims.

Lowland District.—District output was largely 480 tons of old silver tailings shipped from the Ruby Mill dump.

Warm Springs Creek District.—Most of the district output came from 53 tons of gold smelting ore shipped from the Bell, Best & Last claims.

Whitehall District.—Marvin Riebhoff and the Golden Sunlight mine operated the Golden Sunlight property and shipped a total of 1,348 tons of gold smelting ore during the year. The remaining district production was principally 188 tons of lead smelting ore from the Carbonate mine, 171 tons of gold smelting ore from the Lucky Hit mine, 155 tons of lead smelting ore from the Whitehall claim, 97 tons of gold smelting ore from the Florence property, and 60 tons of lead smelting ore from the Big Spot claim.

Wilson and Ticer Creeks District.—Operators at the Callahan property amalgamated a small tonnage of gold ore and shipped 24 tons of similar material to a smelter.

JUDITH BASIN COUNTY

Barker District.—Thorson & Brazee worked the Wright-Edwards (Block P) group all year and shipped 162 tons of zinc-lead smelting ore containing 7 ounces of gold, 5,329 ounces of silver, 887 pounds of copper, 107,478 pounds of lead, and 46,877 pounds of zinc. Other properties worked during the year were the Faith group and the Tiger.

Yogo District.—Walter Lehman operated the Gold Bug and Weatherwax claims from July 1 through October 15, 1950, and shipped 25 tons of gold smelting ore containing 11 ounces of gold and 74 ounces of silver.

LEWIS AND CLARK COUNTY

Heddleston District.—The Mike Horse Mining & Milling Co. reopened its Mike Horse mine in July and operated continuously the remainder of the year. The company's 300-ton flotation mill treated 23,634 tons of zinc-lead ore during the period of operation and recovered 1,372 tons of lead concentrate and 1,626 tons of zinc concentrate. Development at the property during the year included 2,100 feet of crosscuts and drifts.

Helena District.—Porter Bros. operated its 6-cubic-foot bucket-line dredge in Last Chance Gulch until August 25, when the dredge was closed down for lack of additional gravel to treat.

A. O. Barnes worked the Caswell placer with a dragline dredge during July and August and washed 2,800 cubic yards of gravel. The Discovery claim was also worked with a dragline dredge during the summer months. Remaining district output came from gold ore amalgamated at the Sara Jane mine, gold smelting ore shipped from the Independent property, and zinc-lead smelting ore shipped from the Humboldt claim.

Marysville District.—The Montana Rainbow Mining Co. and W. R. Wade operated the Drumlummon mine throughout the year. The 150-ton amalgamation-flotation mill at the property was destroyed by fire on April 2 and was not rebuilt. During the period the mill was in operation 3,800 tons of gold-silver ore were treated by amalgamation in riffle boxes followed by flotation. After April the operators shipped gold ore direct to a smelter. Louis Peura shipped 528 tons of tailings containing 65 ounces of gold, 1,247 ounces of silver, 528 pounds of copper, and 8,872 pounds of zinc from the Big Ox mine. A small quantity of gold was recovered by amalgamation of ore from the Marysville Lode.

Rimini District.—Principal production was 526 tons of lead smelting ore from the Evergreen mine and 99 tons of gold-silver smelting ore from the Free Speech mine and dump.

Scratch Gravel District.—Output was largely 450 tons of gold-silver ore and 16 tons of lead ore shipped to a smelter from the Franklin dump.

Smelter District.—Virtually all the metals credited to the Smelter district came from 20,764 tons of old lead-smelter slag treated at the East Helena slag-fuming plant of the Anaconda Copper Mining Co.

Stemple-Gould District.—Most of the metal production in the district in 1950 came from the Bondholder, Homestake, Iron Nerve, and Lucky Strike mines. Some gold and silver were recovered by amalgamation and concentration of ore from the Rover dump, worked by the Earl Mining Co., Inc.

LINCOLN COUNTY

Sylvanite (Yaak) District.—Exploration and development at the Keystone and Haywire groups of the Morning Glory Mines, Inc., yielded approximately 100 tons of gold ore, which was treated in the company 100-ton flotation mill.

MADISON COUNTY

McCarthy Mountains District.—C. O. Dale & Sons operated the Polly Jane and Bessie properties throughout the year and shipped 132 tons of lead smelting ore and 35 tons of gold-silver smelting ore. Other properties in the district that shipped small lots of smelting ore were the Lucky Knock, McCarthy group, and the Silver Buckle.

Norris and Norwegian District.—The entire district output in 1950 was gold ore—82 tons from the Bayles mine, 2 tons from the Galena, 3 tons from the Lincoln, and 1 ton from the Minnie.

Renova District.—Lessees on the Colorado mine shipped 132 tons of gold smelting ore during the year. Development of the Sunset claim yielded 5 tons of lead smelting ore.

Rochester District.—Commonwealth Lead Mining Co. worked the Calvin mine 3 months of 1950 and shipped 98 tons of lead smelting ore containing 4 ounces of gold, 1,697 ounces of silver, 280 pounds of copper, 70,500 pounds of lead, and 8,047 pounds of zinc. Bork & Verlanic operated the Thistle mine from April to September and milled about 300 tons of gold ore in addition to shipping 15 tons of gold smelting ore and 35 tons of lead smelting ore. Small tonnages of gold smelting ore were also shipped from the Big Bertha, Nobleville, North Star, and Shoemaker mines. A few tons of lead smelting ore were shipped from the Montrose and Plainview properties.

Sheridan District.—Lessees worked the Silver Bar mine and shipped 443 tons of silver smelting ore. Remaining district production came principally from 175 tons of gold-silver smelting ore shipped from the Latest Out claim and 80 tons of silver smelting ore shipped from the Bayard property.

Silver Star District.—The bulk of production was derived from approximately 26,950 tons of gold ore milled from the American Pit (Victoria) mine, which yielded 2,450 tons of copper concentrate.

Tidal Wave District.—As in 1949, virtually all the output of the district was gold ore, 177 tons of which came from the B. & H. Mines and 129 tons from the Moffet claim.

Virginia City District.—Most of the district production was gold-silver smelting ore—6,349 tons from the Cornucopia mine, 2,372 tons from the U. S. Grant mine, 126 tons from the Flagstaff property, 63 tons from the El Fleeda mine, and 56 tons from the Mountain Flower and Mountain Chief claims.

MEAGHER COUNTY

Castle Mountain District.—District production, all lead smelting ore, came from the Cumberland mine operated by the Silverton Mines, Inc., the Yellowstone mine, and the Silver Bullion property.

MINERAL COUNTY

East Hunter District.—Lessees operated the Silver Cable group of claims and milled 3,482 tons of zinc-lead ore which yielded 28 tons of lead concentrate and 129 tons of zinc concentrate.

Iron Mountain (Superior) District.—E. G. Smith, lessee, worked the dumps of the Iron Mountain mine and trucked 2,000 tons of zinc-lead ore to the Nancy Lee mill for recovery of lead and zinc concentrates.

Keystone District.—E. G. Smith also worked the Nancy Lee group and treated 1,200 tons of lead ore in the 100-ton flotation mill at the property.

MISSOULA COUNTY

Coloma District.—Gold smelting ore, which comprised the entire output of the district, was shipped from the Clementha Fraction, I. X. L., and Mammoth and East Mammoth group in 1950.

Copper Cliff (Cramer Creek) District.—Linton Mines operated the Blacktail open-pit mine and 500-ton sink-float plant beginning in March 1950 and treated 16,560 tons of lead ore which yielded 668 tons of lead concentrate.

PARK COUNTY

New World District.—McLaren Gold Mines Co. operated its open-pit Estelle and New Year's Gift group from January 1 through October 30 and treated 30,510 tons of gold ore in the company 200-ton flotation mill. Parkmont Corp. continued operations at the Homestake property; the gold ore mined was treated by amalgamation and concentration; and, in addition to gold bullion, the mill produced a copper concentrate that was shipped to a smelter. E. W. Wade and A. J. Madsen reopened the Big Blue mine south of Cooke City on February 5; 67 tons of lead smelting ore containing 2 ounces of gold, 694 ounces of silver, 264 pounds of copper, 69,324 pounds of lead, and 5,277 pounds of zinc were recovered during development of the property. Most of the remaining district output was lead smelting ore shipped from the Morning Star, New World, Shoo Fly, and Stump mines.

PHILLIPS COUNTY

Little Rockies District.—The Ruby Gulch Mining Co. continued operations at its Ruby Group and 300-ton cyanide leaching plant during 1950. The Gold Bug mine was worked part of the year and 55 tons of silver smelting ore were shipped.

POWELL COUNTY

Nigger Hill District.—Hopkins & Sons Mining Co. operated the Charter Oak mine 7 months of 1950 and shipped 72 tons of gold-silver smelting ore and 5 tons of lead smelting ore. In addition, 200 tons of gold-silver ore were treated in the company 40-ton flotation mill. Newman Bros. worked the Lilly group until June 13 and shipped 88 tons of gold smelting ore. The Golden Anchor Mining & Milling Co. shipped 39 tons of dump ore from the Evening Star property during the year.

Ophir Gulch District.—The Eldorado Mining Co., lessees on the Eldorado 1 and 2 claims, shipped 488 tons of copper smelting ore during the year.

Zozell District.—Most of the district output in 1950 was 159 tons of silver smelting ore shipped from the Hidden Treasure mine and 141 tons of gold smelting ore shipped from the Hidden Hand property.

RAVALLI COUNTY

Overwich (Hughes Creek) District.—About 28 ounces of gold were recovered in the course of development during the year at the Washington claim.

SANDERS COUNTY

Eagle District.—The American Smelting & Refining Co. operated the Jack Waite mine throughout 1950 and produced 6,778 tons of zinc-lead milling ore and 420 tons of lead smelting ore. The milling ore, all treated in the 300-ton flotation plant at the property, contained 7,694 ounces of silver, 1,545,600 pounds of lead, and 373,000 pounds of zinc.

SILVER BOW COUNTY

Ore production in Silver Bow County in 1950 increased to 3,387,270 tons, a 47-percent gain over 1949. The output of gold advanced 47 percent, silver 9 percent, lead 36 percent, and zinc 32 percent. Copper production continued to decline and fell 4 percent under the 1949 level. The total value of the five metals increased 18 percent and represented 93 percent of the State total value. The mines in Silver

Bow County in 1950 produced 45 percent of the State total gold, 93 percent of the silver, 99 percent of the copper, 80 percent of the lead, and 94 percent of the zinc. Table 11 gives the output of mines in the county.

TABLE 11.—Production of gold, silver, copper, lead, and zinc in Silver Bow County, Mont., 1946–50, and total, 1882–1950, in terms of recoverable metal

Year	Mines producing	Ore (short tons)	Gold (lode and placer, fine ounces)	Silver (lode and placer, fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1946	27	1,827,606	6,926	2,417,969	115,809,000	4,713,000	14,216,500	$23,205,317
1947	32	2,624,915	19,801	5,252,011	114,374,000	21,269,500	81,425,000	42,379,878
1948	22	2,637,479	19,163	6,100,232	115,423,500	26,448,900	105,250,800	49,971,332
1949	15	2,297,584	15,757	5,636,112	111,890,500	22,979,600	95,963,100	43,225,091
1950	21	3,387,270	23,163	6,123,549	107,793,300	31,358,800	127,021,000	51,044,252
1882–1950	--------	(1)	2,104,081	568,896,883	[2] 6,768,560	[2] 285,890	[2] 1,775,599	2,786,032,565

[1] Figure not available.
[2] Short tons.

Summit Valley (Butte) District.—Company material treated at the copper concentrator of the Anaconda Copper Mining Co. at Anaconda comprised 1,105,856 tons of copper ore from the main Butte Hill mines (1,180,750 in 1949) and 50,744 tons of special waste (22,198 in 1949). Direct smelting ores totaled 20,246 tons (39,927 in 1949) and mine-water precipitates 5,823 tons (3,838 tons in 1949).

Production of zinc-lead ore from the Butte Hill mines of the Anaconda Copper Mining Co. was 871,191 tons in 1950 (747,962 tons in 1949) and that from the Butte Hill dumps 818,445 tons (261,958 tons in 1949).

The Emma and Travona mines, operated by the Anaconda Copper Mining Co., produced manganese ore that was milled to recover manganese concentrates and a zinc-lead middling concentrate. This middling concentrate was further milled to obtain zinc and lead concentrates amounting to 22,074 tons from the Emma middling and 2,545 tons from the Travona middling.

Copper smelting ore and silver smelting ore constituted most of the remainder of the district output in 1950. Of the copper-ore production, 12,402 tons came from the Bullwhacker claim, 2,953 tons from the Sarsfield mine, and 47 tons from the Columbia property. The most important producers of silver smelting ore included the Alloy mine, with an output of 1,284 tons; the Margaret Ann, 521 tons; the Elba, 235 tons; and the Magna Charta, 129 tons.

Nevada

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By R. B. Maurer

GENERAL SUMMARY

NEVADA copper production, largely from open-pit mines, responded to the stimulus of great demand and generally favorable base-metal prices in 1950 and advanced over 1949. Gold output, reflecting expanded large-scale placer mining and greater yield from both gold ore and copper ore, also increased in 1950, whereas output of silver, principally from fluxing ores and ores mined primarily for other metals, dropped in 1950. Lead production fell below the 1949 level owing largely to lower yield from straight lead ore and the closing for more than half the year of the State's second-largest lead-producing mine (also a leading silver producer) following a shaft fire. Zinc output was up compared with 1949. The total value of gold, silver, copper, lead, and zinc recovered from ores, old tailings, and gravels mined at 325 lode mines and 25 placer properties in 1950 was $38,181,872 an increase of 29 percent compared with $29,615,777, the 1949 output by 332 lode mines and 37 placer mines in 1949.

Comparing 1950 with 1949, the gold output increased 37 percent in quantity and value; copper increased 38 percent in quantity and 46 percent in value; zinc increased 6 percent in quantity and 21 percent in value; silver decreased 15 percent in quantity and value; and lead decreased 11 percent in quantity and 24 percent in value. Of the total value of the five metals, copper comprised 57 percent, gold and zinc 16 percent each, lead 7 percent, and silver 4 percent.

White Pine County accounted for 62 percent of the State total value of the five metals which were produced in 17 counties, all told, in 1950. It stood first in the State in the output of copper and gold, third in zinc and silver, and fourth in lead. Lincoln County, with 22 percent of the State total value, led in production of silver, lead, and zinc and was second in copper and eighth in gold.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

Yardage figures used in measuring material treated in placer operations are "bank measure"; that is, the material is measured in the ground before treatment.

The value of metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Nevada, 1946–50, and total 1859–1950, in terms of recoverable metal [1]

Year	Mines producing [2]		Ore and old tailings sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1946	193	33	5,725,805	90,680	$3,173,800	1,250,651	$1,010,526
1947	276	31	6,541,635	89,063	3,117,205	1,377,579	1,246,709
1948	350	36	7,172,611	111,532	3,903,620	1,790,020	1,620,058
1949	332	37	5,987,013	130,399	4,563,965	1,800,209	1,629,280
1950	325	25	7,745,119	178,447	6,245,645	1,537,217	1,391,259
1859–1950 [3]			(4)	26,026,442	589,487,146	596,108,737	546,613,908

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	48,616	$15,751,584	7,175	$1,564,150	22,649	$5,526,356	$27,026,416
1947	49,603	20,833,260	7,161	2,062,368	16,970	4,106,740	31,366,282
1948	45,242	19,635,028	9,777	3,500,166	20,288	5,396,608	34,055,480
1949	38,058	14,994,852	10,626	3,357,816	20,443	5,069,864	29,615,777
1950	52,569	21,868,704	9,408	2,540,160	21,606	6,136,104	38,181,872
1859–1950 [3]	1,968,140	583,035,366	584,152	71,708,027	426,795	76,197,832	1,867,042,279

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes retreated; and ore, old tailings, or copper precipitates shipped directly to smelters during the calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] From 1904 (when first satisfactory annual canvass of mine production was made) to 1950, inclusive, the output was as follows: Gold, 14,199,566 ounces valued at $345,003,913; silver, 307,695,888 ounces, $209,455,685; copper, 1,966,214 tons, $582,388,738; lead, 346,361 tons, $49,071,465; zinc, 426,795 tons, $76,197,832; total value, $1,262,117,633.
[4] Figure not available.

Gold.—Gold from lode mines comprised 80 percent of the State's total gold in 1950 as compared with 94 percent of the smaller 1949 total and placer gold 20 percent (6 percent in 1949). The upsurge in lode-gold mining which began during 1949 continued until late in 1950, when high operating costs caused the closing of many Nevada gold properties, including those engaged in large-scale custom milling of precious metal ores. Gold from precious metal ores increased 12 percent compared with 1949 and comprised 49 percent of the State's total (60 percent in 1949). Byproduct gold from base-metal ores (largely copper ore) comprised 31 percent of the gold output (34 percent in 1949). Uninterrupted working during 1950 of Nevada's only bucket-line dredge and operation of the new project treating gold-bearing alluvium at Round Mountain, Nye County, during 1950 was reflected in the 358-percent increase in placer gold over 1949.

The 10 leading gold-producing mines in 1950 listed in table 3 contributed 88 percent of Nevada's output; the 4 leaders alone produced 65 percent.

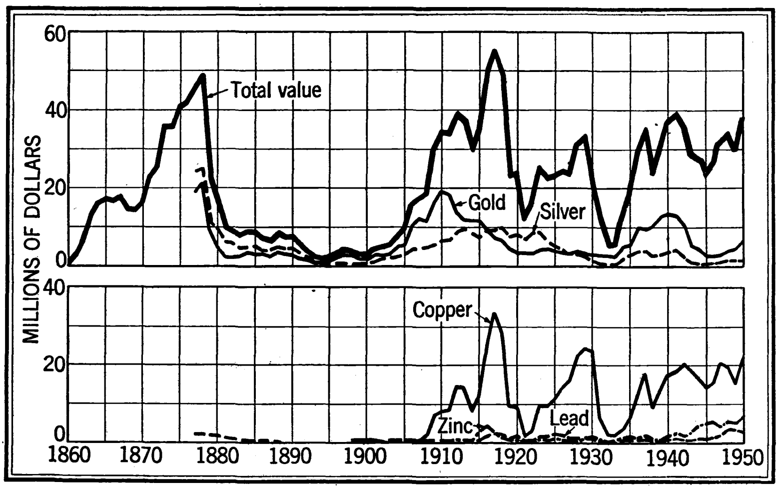

FIGURE 1.—Value of mine production of gold, silver, copper, lead, and zinc in Nevada, 1860–1950.

Silver.—In 1950 silver was produced principally as a byproduct, since a large percentage of the straight silver ore mined either was utilized as a fluxing material or beneficiated mainly for its contained base metals. However, the silver content of Nevada ores, still economically important, often was the determining factor in treating mined material profitably during the year. Base-metal ores were the source of 63 percent of the State silver production in 1950 (57 percent in 1949), while straight silver ore contributed 9 percent (17 percent in 1949).

The 10 leading silver-producing mines shown in table 3 yielded 79 percent of the State's output; the 3 leaders contributed 57 percent.

Copper.—Nevada copper production was centered in the Robinson (Ely) district, White Pine County, where the State's two leading producers—Kennecott Copper Corp. and Consolidated Coppermines Corp.—mined the porphyry ore of that district by open-pit method and supplied all but a small percentage of the State's total 1950 copper output. Data on a Humboldt County copper deposit were published.[1]

[1] Trengrove, Russell R., Investigation of the Cove Meadow Copper Deposit, Humboldt County, Nev.: Bureau of Mines Rept. of Investigations 4694, 1950, 6 pp.

TABLE 3.—Ten leading gold-producing mines and 10 leading silver-producing mines in Nevada in 1950, in order of output

Rank	Mine	District	County	Rank in 1949	Operator	Source of metal
			GOLD-PRODUCING MINES			
1	Ruth Pit	Robinson	White Pine	1	Kennecott Copper Corp. (Nevada Mines Division).	Copper ore.
2	Getchell & Pinson-Ogee	Potosi	Humboldt	2	Getchell Mine, Inc	Gold ore.
3	Greenan Placers	Battle Mountain	Lander	8	Natomas Co	Dredge.
4	Goldacres	Bullion	do	3	London Extension Mining Co	Gold ore.
5	Round Mountain	Round Mountain	Nye	(1)	Round Mountain Gold Dredging Co	Placer.
6	Ruth Pit Extension	Robinson	White Pine	4	Consolidated Coppermines Corp	Copper ore.
7	Deep Mines group	Goldfield	Esmeralda	6	Goldfield Deep Mines Co. of Nevada	Gold ore
8	Chesco	Aurora	Mineral	15	Chessher & Co	Do.
9	Pioche group	Pioche	Lincoln	7	Combined Metals Reduction Co	Zinc-lead ore.
10	Keystone	Comstock	Storey	9	Dayton Consolidated Mines Co	Gold ore.
			SILVER-PRODUCING MINES			
1	Pioche group	Pioche	Lincoln	1	Combined Metals Reduction Co	Zinc-lead ore.
2	Summit King group	Sand Springs	Churchill	3	Summit King Mines, Ltd	Gold-silver ore.
3	Ruth Pit	Robinson	White Pine	5	Kennecott Copper Corp. (Nevada Mines Division).	Copper ore.
4	Copper Canyon	Battle Mountain	Lander	2	Copper Canyon Mining Co	Silver ore.
5	Central Comstock tailings	Comstock	Storey	8	Central Comstock Mines Corp	Gold-silver tailings.
6	Bristol	Jack Rabbit	Lincoln	7	Bristol Silver Mines Co	Zinc-lead-copper ore.
7	Ely Valley	Pioche	do	10	Ely Valley Mines, Inc	Zinc-lead ore.
8	Pansy Lee (West Coast)	Barrett Springs	Humboldt	(1)	Pansy Lee Mining Co	Gold-silver ore.
9	Delno	Delano	Elko	12	McFarland & Hullinger	Lead ore.
10	Ruth Pit Extension	Robinson	White Pine	11	Consolidated Coppermines Corp	Copper ore.

[1] Did not produce in 1949.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	13, 892	117, 567	3, 641	823	1, 596
February	14, 185	141, 657	3, 095	904	1, 547
March	17, 636	145, 663	3, 571	913	1, 916
April	16, 857	147, 339	3, 715	725	2, 208
May	16, 967	141, 040	3, 554	840	1, 773
June	15, 945	126, 694	4, 723	720	1, 675
July	16, 180	123, 053	4, 812	693	1, 510
August	16, 229	130, 872	5, 369	789	2, 056
September	13, 529	130, 311	4, 372	788	1, 850
October	12, 569	117, 549	6, 218	808	1, 784
November	11, 794	110, 472	4, 873	660	1, 796
December	12, 664	105, 000	4, 626	745	1, 895
Total: 1950	178, 447	1, 537, 217	52, 569	9, 408	21, 606
1949	130, 399	1, 800, 209	38, 058	10, 626	20, 443

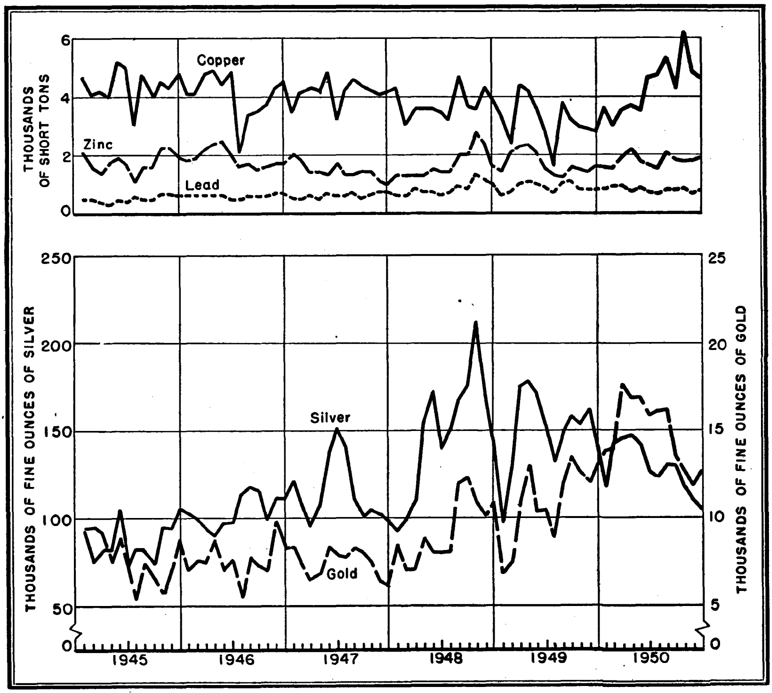

FIGURE 2.—Mine production of gold, silver, copper, lead, and zinc in Nevada, 1945–50, by months, in terms of recoverable metal.

Lead.—Recoverable lead in Nevada in 1950 was produced mainly from zinc-lead ore. The lead yield from straight lead ore declined 45 percent compared with 1949. Of the mines that produced the metal in 1950, only 2 had an output of more than 500 tons of recoverable lead during the year, 2 produced between 250 and 500 tons and 12 mined between 50 and 250 tons. Of the State's total, 72 percent was mined in the Pioche district, Lincoln County. The leading producers were: The Combined Metals Reduction Co., Pioche group, Pioche district, Lincoln County (zinc-lead ore); Copper Canyon Mining Co., Copper Canyon mine, Battle Mountain district, Lander County (silver ore), inoperative for 6 months of 1950; Ely Valley Mines, Inc., Ely Valley mine, Pioche district, Lincoln County (zinc and zinc-lead ore); Bristol Silver Mines Co., Bristol mine, Jack Rabbit district, Lincoln County (zinc-lead-copper ore); and McFarland & Hullinger, Delno mine, Delano district, Elko County (lead ore).

Zinc.—Nevada zinc production was centered in the Pioche district, Lincoln County, where zinc and zinc-lead ores mined and concentrated were the source of 91 percent of the State 1950 total zinc production. Rising zinc prices in 1950, especially after midyear, made possible the movement to a Utah slag-fuming plant of notable tonnages of oxidized zinc ore, largely from mines in Clark, Eureka, and White Pine Counties, and from the former Metals Reserve Co. World War II stockpile of Clark County ore at Jean, Nev. Only two mines had an output of more than 500 tons of recoverable zinc during the year, and nine mines produced in the range of 50 to 200 tons of zinc. Leading producers of recoverable zinc were: Combined Metals Reduction Co., Pioche group, and Ely Valley Mines, Inc., Ely Valley mine, both in the Pioche district, Lincoln County; Copper Canyon Mining Co., Copper Canyon mine, Battle Mountain district, Lander County; and L. F. Jacobson, Yellow Pine mine, Yellow Pine district, Clark County.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by counties, in terms of recoverable metal

County	Mines producing [1]		Gold						Silver (lode and placer)	
			Lode		Placer		Total			
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Churchill	13		2,450	$85,750			2,450	$85,750	203,657	$184,320
Clark	22		1,647	57,645			1,647	57,645	16,768	15,176
Douglas	2		11	385			11	385	17	15
Elko	34		210	7,350			210	7,350	75,399	68,240
Esmeralda	27	(2)	6,959	243,565	3	$105	6,962	243,670	22,541	20,401
Eureka	15	1	406	14,210	2	70	408	14,280	31,469	28,481
Humboldt	12	[3] 6	34,781	1,217,335	[3] 25,307	[3] 885,745	[3] 60,088	[3] 2,103,080	[3] 44,143	[3] 39,952
Lander	18	(3)	21,527	753,445	(3)	(3)	[3] 21,527	[3] 753,445	[3] 93,756	[3] 84,854
Lincoln	12		4,861	170,135			4,861	170,135	671,035	607,321
Lyon	13	(2)	650	22,750	2	70	652	22,820	3,295	2,982
Mineral	28	1	6,550	229,250	8	280	6,558	229,530	56,379	51,025
Nye	39	8	1,030	36,050	10,793	377,755	11,823	413,805	23,768	21,511
Ormsby	1		6	210			6	210	284	257
Pershing	14	6	233	8,155	161	5,635	394	13,790	1,983	1,795
Storey	9		9,691	339,185			9,691	339,185	108,944	98,600
Washoe	10		443	15,505			443	15,505	239	216
White Pine	56	3	50,614	1,771,490	102	3,570	50,716	1,775,060	183,540	166,113
Total: 1950	325	25	142,069	4,972,415	36,378	1,273,230	178,447	6,245,645	1,537,217	1,391,259
1949	332	37	122,457	4,285,995	7,942	277,970	130,399	4,563,965	1,800,209	1,629,280

For footnotes, see end of table.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by counties, in terms of recoverable metal—Continued

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Churchill			4,400	$594			$270,664
Clark	6,300	$1,310	376,500	50,827	1,288,300	$182,939	307,897
Douglas	2,000	416					816
Elko	92,700	19,281	1,400,600	189,081	150,400	21,357	305,309
Esmeralda	4,200	874	151,700	20,480	7,400	1,051	286,476
Eureka	3,200	666	162,200	21,897	660,500	93,791	159,115
Humboldt	3,200	666	1,500	203	400	57	[3] 2,143,958
Lander	85,200	17,722	1,136,200	153,387	394,600	56,033	[3] 1,065,441
Lincoln	669,900	139,339	14,307,800	1,931,553	39,757,500	5,645,565	8,493,913
Lyon	26,400	5,491	30,400	4,104	10,100	1,434	36,831
Mineral	9,800	2,038	263,300	35,545	5,800	823	318,961
Nye	3,500	728	189,000	25,515	100	14	461,573
Ormsby	100	21	6,000	810			1,298
Pershing			18,000	2,430			18,015
Storey			100	14			437,799
Washoe			4,200	567			16,288
White Pine	104,231,500	21,680,152	764,100	103,153	936,900	133,040	23,857,518
Total: 1950	105,138,000	21,868,704	18,816,000	2,540,160	43,212,000	6,136,104	38,181,872
1949	76,116,000	14,994,852	21,252,000	3,357,816	40,886,000	5,069,864	29,615,777

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] From property not classed as a mine.
[3] Placer production from Humboldt and Lander Counties combined to avoid disclosure of output.

MINING INDUSTRY

Demonstrating the ability of open-pit mine production to respond quickly to changing market conditions, Nevada's copper production, after 5 months of moderate output, rose to a high level in June and subsequent months. It was primarily this expansion in open-pit copper that accounted for the 29-percent increase in total tonnage of Nevada ores and old tailings sold or treated in 1950 compared with 1949. Lead and zinc mines, predominantly underground operations, responded slowly to the incentive of higher metal prices because ore reserves needed for expanded production were not developed during the preceding period of depressed metal prices. Mining of precious metal ores declined sharply late in 1950 owing to a fixed gold price in the face of steadily increasing operating costs. The collapse of custom milling in the Virginia City-Silver City area of Lyon and Storey Counties and at Goldpoint, Esmeralda County, virtually halted mining of precious metal ores in these and neighboring districts after September. It was significant that the State's six leading gold-producing mines in 1950 were worked by surface methods.

Led by the Natomas Co.[2] bucket-line dredge in Lander County and the Round Mountain Dredging Corp.[3] conveyor-milling operation in Nye County, Nevada placer mines treated 5,243,450 cubic yards of material averaging $0.243 per cubic yard in 1950 compared with 1,382,140 cubic yards averaging $0.201 per cubic yard in 1949. Of the 25 placer mines that reported production in 1950, 1 was worked by bucket-line dredge, 10 by power excavators and washing plants, 3 by underground methods, and 11 by small-scale hand methods.

[2] *See* Engineering and Mining Journal, vol. 151, No. 10, October 1950, pp. 96–99.
[3] *See* Mining World, vol. 12, No. 7, June 1950, pp. 26–31.

ORE CLASSIFICATION

Nevada ores sold or treated in 1950 are classified in table 6. Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by class of ore or other source material, in terms of recoverable metal

Class of material	Number of mines [1]	Material sold or treated: Ore (short tons)	Material sold or treated: Old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold	132	635,952	19,272	81,090	92,601	30,400	1,800	------
Dry gold-silver	48	26,634	49,008	5,544	330,365	1,300	72,800	3,100
Dry silver	52	37,436	119	701	145,922	55,300	1,268,600	400,100
Total	218	700,022	68,399	87,335	568,888	87,000	1,343,200	403,200
Copper ore	26	6,693,277	------	49,438	147,599	[2] 104,264,500	700	------
Lead ore	64	[3] 10,906	------	[4] 611	[4] 115,794	[4] 23,700	[4] 2,436,000	[4] 32,100
Lead-copper ore	3	1,462	------	9	13,043	85,900	276,100	61,100
Zinc ore	13	[5] 37,539	------	[5] 172	[5] 21,465	[5] 62,800	[5] 432,200	[5] 8,496,900
Zinc-lead ore	24	230,167	------	4,470	600,682	366,400	13,720,400	33,868,500
Zinc-lead-copper ore	4	3,347	------	34	59,946	247,700	607,400	350,200
Total	115	[3,5] 6,976,698	------	[4,5] 54,734	[4,5] 958,529	[2,4,5] 105,051,000	[4,5] 17,472,800	[4,5] 42,808,800
Total lode mines	325	[3,5] 7,676,720	68,399	[4,5] 142,069	[4,5] 1,527,417	[2,4,5] 105,138,000	[4,5] 18,816,000	[4,5] 43,212,000
Gravel (placer operations)	25	------	------	36,378	9,800	------	------	------
Total: 1950	350	[3,5] 7,676,720	68,399	[4,5] 178,447	[4,5] 1,537,217	[2,4,5] 105,138,000	[4,5] 18,816,000	[4,5] 43,212,000
1949	369	[3] 5,938,801	48,212	130,399	[4] 1,800,209	[6] 76,116,000	[4] 21,252,000	[4] 40,886,000

[1] Detail will not add to totals because some mines produce over 1 class of ore.
[2] Includes 799,500 pounds from precipitates.
[3] Excludes tungsten ore.
[4] Includes metal recovered from tungsten ore.
[5] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[6] Includes metal recovered from tungsten ore; also includes 1,038,400 pounds from precipitates.

METALLURGICAL INDUSTRY

Of the 7,745,119 tons of lode material (including 68,399 tons of old tailings) from Nevada mines sold or treated during 1950, 99 percent (the output of 161 mines) went to mills and 1 percent (the output of 164 mines) to smelters. In addition to companies that operated metallurgical plants exclusively for their ores, the Combined Metals Reduction Co. at Pioche, Lincoln County,[4] treated by selective flotation zinc and zinc-lead ores on a custom basis from two Nevada mines and one Utah property and also milled company zinc-lead ore. The Kennecott Copper Corp. treated all the copper ore produced by Consolidated Coppermines Corp. on a contract basis, in addition to milling its own ore at the McGill concentrator. Kennecott also operated the McGill copper smelter, Nevada's only smelter, treating—in addition to copper ore and copper concentrate—gold and silver ores used for fluxing. The Dayton Consolidated Mining Co. milled gold and silver ore and tailings from mines in nine Nevada counties at the company flotation-cyanide plant in the Comstock district,

[4] *See* Holmes, George H. Jr., Mining and Milling Methods at the Caselton Mine, Combined Metals Reduction Co., Pioche, Lincoln County, Nev.: Bureau of Mines Inf. Circ. 7586, 1950, 24 pp.

Storey County, and the San Francisco Mining & Engineering Co. beneficiated precious metal ores on a custom basis at its Stateline mill in the Hornsilver district, Esmeralda County. Several other Nevada mills accepted occasional lots of custom ore.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	36,378	9,800			
Amalgamation	5,083	3,182			
Cyanidation	69,188	344,114			
Smelting of:					
Ore and old tailings	4,427	326,798	1,445,300	3,726,300	3,276,700
Concentrate	63,371	853,323	102,893,200	15,089,700	39,935,300
Precipitates (copper)			799,500		
Total: 1950	178,447	1,537,217	105,138,000	18,816,000	43,212,000
1949	130,399	1,800,209	76,116,000	21,252,000	40,886,000

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore and old tailings treated at mills

	Material treated		Recoverable in bullion		Concentrate shipped to smelters and recoverable metal [1]					
	Ore [2] (short tons)	Old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES										
Churchill	18,329		2,447	202,171	2	1	122		600	
Clark	1,680	17,631	697	2,639	64	874	1,731	500	34,000	3,000
Douglas	2		4	2						
Elko	1,518	1,700	176	3,723	275	9	4,706	100	98,700	91,200
Esmeralda	12,623		348	5,439	737	6,450	1,560	2,700	2,400	7,400
Eureka	43				34		42		10,100	13,400
Humboldt	376,048		34,366	6,019	2	2	152	100	1,500	400
Lander	184,999		20,552	1,934	1,799	646	77,395	78,000	1,112,600	394,600
Lincoln	262,472				52,544	4,596	602,717	423,200	13,659,300	39,414,800
Lyon	1,192		644	2,830						
Mineral	13,021		3,948	12,843	95	2,120	18,049	600	19,000	4,200
Nye	1,363		772	870	29	14	1,305	100	19,700	100
Ormsby	55				11	6	284	100	6,000	
Pershing	626		204	148	25	16	864		5,600	
Storey	77,050	48,808	9,670	108,520	2	21	424		100	
Washoe	642		443	158						
White Pine	6,629,448				205,769	48,616	143,972	102,387,800	120,100	6,200
Total: 1950	7,581,111	68,139	74,271	347,296	261,388	63,371	853,323	102,893,200	15,089,700	39,935,300
1949	5,856,191	47,932	65,877	435,311	206,478	52,770	956,089	73,654,700	15,979,800	38,859,500
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS										
Dry gold					811	9,565	18,526	2,700	100	
Dry gold-silver					21	36	1,612	100	1,100	600
Dry silver					102	1	196		1,700	200
Copper					205,714	48,655	143,008	102,414,800	1,200	
Lead					15,832	3,401	446,202	63,400	12,831,400	1,620,400
Zinc					37,226	1,235	167,150	360,800	1,133,900	37,916,100
Zinc-lead					1,674	476	76,381	50,800	1,114,200	395,800
Zinc-lead-copper					8	2	248	600	6,100	2,200
Total 1950					261,388	63,371	853,323	102,893,200	15,089,700	39,935,300

For footnotes, see end of table.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal—Continued

B. For ore and old tailings shipped directly to smelters

	Material treated		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
	Ore (short tons)	Old tailings (short tons)					
BY COUNTIES							
Churchill	37		2	1,364		3,800	
Clark [3]	3,442		76	12,398	5,800	342,500	1,285,300
Douglas	33		7	15	2,000		
Elko	4,866		25	66,970	92,600	1,301,900	59,200
Esmeralda	863		161	15,541	1,500	149,300	
Eureka	2,286		406	31,427	3,200	152,100	647,100
Humboldt	999		413	34,452	3,100		
Lander	609		329	14,427	7,200	23,600	
Lincoln	3,882	170	265	68,318	246,700	648,500	342,700
Lyon	319		6	464	26,400	30,400	10,100
Mineral	2,094		482	25,481	9,200	244,300	1,600
Nye	1,553	83	244	15,406	3,400	169,300	
Pershing	63		13	905		12,400	
Washoe	7			81		4,200	
White Pine	74,556	7	1,998	39,549	[4] 1,843,700	644,000	930,700
Total: 1950	95,609	260	4,427	326,798	[4] 2,244,800	3,726,300	3,276,700
1949	82,610	280	3,810	407,133	[5] 2,461,300	5,272,200	2,026,500
BY CLASS OF MATERIAL							
Dry gold	1,659	141	1,638	1,530	500	100	
Dry gold-silver	4,524		1,078	57,764	1,000	31,300	
Dry silver	2,921	119	198	61,083	4,400	52,800	1,200
Copper	67,257		825	5,098	[4] 1,876,900	700	
Lead	7,875		603	113,659	22,100	2,228,200	28,900
Lead-copper	1,462		9	13,043	85,900	276,100	61,100
Zinc [3]	[4] 5,196		21	9,645	1,500	265,500	2,410,100
Zinc-lead	1,368		21	5,030	4,800	264,200	425,200
Zinc-lead-copper	3,347		34	59,946	247,700	607,400	350,200
Total 1950	95,609	260	4,427	326,798	[4] 2,244,800	3,726,300	3,276,700

[1] Includes concentrates from tungsten ore (not included in "material treated") and recoverable metal content thereof.
[2] Figures under "ore" include both raw ore and concentrates produced from that ore, amalgamated or cyanided.
[3] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[4] Includes 799,500 pounds from precipitates.
[5] Includes 1,038,400 pounds from precipitates.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	811	9,567	18,554	2,795	192	
Dry gold-silver	21	36	1,617	167	1,295	861
Dry silver	102	1	196	95	2,601	3,911
Copper	205,714	49,654	155,099	104,607,475	1,993	
Lead	15,832	3,401	446,202	75,510	13,059,906	2,252,653
Zinc	37,226	1,235	167,150	380,106	1,229,949	38,739,687
Zinc-lead	1,674	476	76,381	59,715	1,133,579	546,711
Zinc-lead-copper	8	2	248	741	6,195	2,763
Total: 1950	261,388	64,372	865,447	105,126,604	15,435,710	41,546,586
1949	206,478	53,540	967,178	75,273,556	16,349,020	40,812,973
ORE AND OLD TAILINGS SHIPPED DIRECTLY TO SMELTERS						
Dry gold ore and old tailings	1,800	1,658	1,608	567	199	18
Dry gold-silver ore	4,524	1,097	61,987	1,278	35,262	2,183
Dry silver ore and old tailings	3,040	201	63,019	5,222	76,152	15,689
Copper ore	67,257	842	5,446	[1] 1,917,489	1,203	579
Lead ore	7,875	603	113,659	30,458	2,297,931	141,298
Lead-copper ore	1,462	9	13,043	106,051	281,698	84,361
Zinc ore [2]	5,196	56	15,071	27,987	266,829	2,978,714
Zinc-lead ore	1,368	23	5,408	6,152	268,158	567,510
Zinc-lead-copper ore	3,347	34	59,946	291,525	617,843	483,804
Total: 1950	95,869	4,523	339,187	[1] 2,386,729	3,845,275	4,274,156
1949	82,890	3,846	416,393	[3] 2,566,749	5,494,098	2,729,666

[1] Includes 816,676 pounds from precipitates.
[2] Includes 2,197 tons of ore and contained metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[3] Includes 1,060,572 pounds from precipitates.

REVIEW BY COUNTIES AND DISTRICTS

CHURCHILL COUNTY

Eastgate District.—Gale G. Peer worked the Oro-Plata (Wilson) mine from March through September 1950 and shipped 43 tons of ore, containing (gross) 13 ounces of gold and 721 ounces of silver, to a custom mill.

Sand Springs District.—Summit King Mines, Ltd., operated the Summit King group throughout 1950; 18,227 tons of ore (including a small quantity of custom ore) cyanided at the company plant yielded 2,466 ounces of gold and 200,618 ounces of silver.

CLARK COUNTY

Searchlight District.—The Desert Milling Co. recovered 668 ounces of gold and 2,626 ounces of silver from 17,631 tons of Quartette-mine tailings by cyanidation at the company 100-ton mill during 1950. Other mines operated included the Herland group (Golden Empire Mining Co.), Parallel group (Jeff Reid), Red Bird group (J. O. Knapp), and Ruth Elder (Ruth Elder Mining Co.).

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing [1]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (lode and placer) [2] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Churchill County:											
Desert	1	--	5	2	--	2	14	--	--	--	$83
Eastgate (Buffalo)	3	--	67	22	--	22	592	--	3,800	--	1,819
Fairview	2	--	19	12	--	12	215	--	--	--	615
Holy Cross	2	--	(3)	(3)	--	(3)	(3)	--	(3)	--	(3)
Sand Springs	2	--	18,201	2,411	--	2,411	200,217	--	--	--	265,591
Truckee (Fireball)	1	--	(3)	--	--	--	(3)	--	(3)	--	(3)
Wonder	2	--	28	2	--	2	1,019	--	--	--	992
Clark County:											
Bunkerville	2	--	2	1	--	1	2	100	--	--	58
Charleston Mountains	1	--	6	--	--	--	3	--	3,500	--	475
Eldorado Canyon	1	--	115	--	--	--	96	500	4,600	1,800	1,068
Gold Butte	(4)	--	1	1	--	1	--	--	--	--	35
Searchlight	10	--	18,967	1,620	--	1,620	4,152	1,700	600	--	60,892
Yellow Pine (Goodsprings)	8	--	[5] 3,662	[5] 25	--	[5] 25	[5] 12,515	[5] 4,000	[5] 367,800	[5] 1,286,500	[5] 245,369
Douglas County:											
Buckskin	1	--	33	7	--	7	15	2,000	--	--	674
Mountain House	1	--	2	4	--	4	2	--	--	--	142
Elko County:											
Delano	3	--	2,560	7	--	7	49,145	4,300	712,700	--	141,832
Edgemont (Centennial)	2	--	62	4	--	4	2,426	800	5,000	500	3,248
Ferber	1	--	34	--	--	--	8	6,400	--	--	1,338
Gold Basin (Hicks)	1	--	3	1	--	1	190	--	--	--	207
Gold Circle	5	--	47	98	--	98	3,648	--	--	--	6,732
Island Mountain	1	--	26	1	--	1	109	--	1,200	500	367
Jarbidge	3	--	252	56	--	56	49	--	--	--	2,004
Merrimac	2	--	381	3	--	3	3,646	100	54,500	90,400	23,621
Mountain City (Cope)	1	--	16	--	--	--	7	3,600	--	--	755
Mud Springs	1	--	856	--	--	--	1,306	--	64,800	1,700	10,171
Railroad (Bullion)	3	--	1,353	7	--	7	11,924	74,600	211,700	52,400	62,575
Rock Creek	1	--	14	3	--	3	346	--	--	--	418
Ruby Range	5	--	393	3	--	3	1,187	2,200	241,800	4,900	34,975
Ruby Valley	1	--	3	--	--	--	7	--	300	--	46
Tecoma	1	--	384	1	--	1	1,299	700	108,600	--	16,018
Tuscarora	3	--	1,700	26	--	26	102	--	--	--	1,002
Esmeralda County:											
Divide	2	--	156	81	--	81	1,945	--	--	--	4,595
Goldfield	1	--	(3)	(3)	--	(3)	(3)	(3)	--	--	(3)
Hornsilver	6	--	1,127	205	--	205	4,555	--	900	--	11,419
Klondyke	3	--	179	34	--	34	4,619	100	8,000	--	6,471

Lida	6	(4)	135	22	3	25	694		2,100	7,400	2,838
Montezuma	1		442	15		15	8,542	1,400	136,600		26,988
Palmetto	1		8				43		3,800		553
Silver Peak	3		78	42		42	343				1,780
Tokop	3		163	66		66	239				2,526
White Wolf	1		66	47		47	41		300		1,723
Eureka County:											
Antelope	1		43				42		10,100	13,400	3,304
Buckhorn	1		21	6		6	49				254
Cortez	3		812	242		242	25,092	2,700	25,800		35,225
Diamond	1		13				61		1,300	3,900	785
Eureka (Lone Mountain)	9		1,440	158		158	6,225	500	125,000	643,200	119,477
Lynn		1			2	2					70
Humboldt County:											
Awakening	2		59,838	2,222		2,222	1,453				79,085
Barrett Springs	2		986	415		415	34,413				45,671
Battle Mountain [6]	1		14	1		1	30	2,600			603
Dunnashee		1			2	2					70
Dutch Flat		1			151	151	18				5,301
Gold Run	1	1	35	2	171	173	184	100	1,500	400	6,503
National	(4)		Clean-up	3		3	3				108
Potosi	2		(3)	(3)		(3)	(3)				(3)
Sawtooth		1			6	6	1				211
Ten Mile	2		26	16		16	31				588
Warm Springs (Cove Meadows).	1		4				10	500			113
Winnemucca	1		20	7		7	4				248
Lander County:											
Battle Mountain [6]	5	2	34,627	566	(3)	[7] 566	[7] 77,214	81,700	1,128,900	393,600	[7] 314,980
Bullion	5		149,008	20,405		20,405	3,609	2,400	3,600	600	718,511
Hilltop	1		(3)	(3)		(3)	(3)				(3)
Lewis	2		199	5		5	11,390	1,000	2,400		11,016
New Pass	1		1,697	529		529	313				18,798
Reese River	4		27				1,203	100	1,300	400	1,342
Lincoln County:											
Comet	1		616	19		19	1,613	2,400	27,200	104,800	21,178
Ferguson	1		305	201		201	156	200			7,218
Groom	2		2,733	1		1	1,076	1,200	159,000		22,724
Jack Rabbit	1		(3)	(3)		(3)	(3)	(3)	(3)	(3)	(3)
Pioche (Highland)	6		259,565	4,607		4,607	608,710	420,300	13,522,900	39,310,000	8,207,191
Viola	1		7				152	600			263
Lyon County:											
Palmyra (Como)	1		5	1		1	5				40
Silver City	5	(4)	783	476	2	478	787				17,442
Talapoosa	1		(3)	(3)		(3)	(3)				(3)
Wellington	1		181	3		3	312	2,100	26,000	5,900	5,172
Yerington	5		171	11		11	154	24,300	4,400	4,200	6,768

For footnotes, see end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1950, by counties and districts, in terms of recoverable metal—Continued

County and district	Mines producing [1]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (lode and placer) [2] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Mineral County:											
Acme (Fitting)	2		94	28		28	7				$986
Aurora	1		(3)	(3)		(3)	(3)				(3)
Bovard (Rand)	1		2				21		700		113
Broken Hills	2		595	32		32	8,274	100	4,200	1,500	9,409
Candelaria	2		1,863	459		459	20,858	700	234,600		66,759
Cedar Mountains (Simon)	2		58	23		23	101	1,400	500		1,255
East Walker	3		102	15		15	243	200	3,300	200	1,260
Garfield	1		14	2		2	180				233
Gillis	1		13	15		15	7				531
Hawthorne	3		95	67		67	989	500	2,400	2,100	3,966
Rawhide (Regent)	3	1	67	12	8	20	367		800		1,140
Santa Fe	3		71	7		7	357	6,600	500		2,009
Silver Star (Marietta)	4		[8] 100	[9] 72		[9] 72	[9] 642	[9] 300	[9] 16,300	[9] 2,000	[9] 5,647
Nye County:											
Athens	1		63	18		18	5				635
Bellehelen	1		24	4		4	221				340
Belmont (Philadelphia)	1		27				281				254
Bullfrog	2		460	519		519	253				18,894
Clifford	1		Clean-up	2		2	1				71
Cloverdale	2		(3)	(3)		(3)	(3)				(3)
Ellendale	1		49	17		17	1,002				1,502
Fluorine	2		(3)	(3)		(3)	(3)				(3)
Jackson	1		7	3		3	2				107
Jefferson Canyon	1		32	3		3	502				559
Johnnie	1	(4)	28	26	1	27	1				946
Lodi (Mammoth)	2		18	1		1	230				243
Manhattan	9	7	919	317	371	688	1,555				25,487
Millett	1		8	20		20	34				731
Morey	1		22				449				406
Quartz Mountain	1		1,111	28		28	9,650	2,700	184,100		35,128
Quinn (Willow Creek)	1		20	4		4	151				277
Round Mountain	3	1	7	14	(3)	[7] 14	[7] 36				523
San Antone	1		25				387	200	300		433
Tonopah	1		64	24		24	2,336				2,954
Troy	1		20	5		5	1				176
Tybo	1		9				83				75
Union	2		9	6		6	46	600			377
Washington	1		31	1		1	458		4,600	100	1,085
Ormsby County: Voltaire	1		55	6		6	284	100	6,000		1,298

Pershing County:											
Antelope	1		16				215		800		303
Haystack	1		16	6		6	6				215
Humboldt (Imlay)		2			7	7					245
Kennedy	1		250	16		16	864		5,600		2,098
Rabbit Hole		1			19	19	3				668
Rochester	1	1	70	33	51	84	26				2,963
Rye Patch	(4)		Clean-up	1		1	2				37
Seven Troughs	6		240	169		169	197				6,093
Sierra	2		51	5		5	3				178
Table Mountain	1		1	1		1	1				36
Trinity (Arabia)	1		45	2		2	622		11,600		2,199
Willow Creek		2			84	84	44				2,980
Storey County: Comstock	9		125,858	9,691		9,691	108,944		100		437,799
Washoe County:											
Galena	1		7				81		4,200		640
Olinghouse (White Horse)	9		642	443		443	158				15,648
White Pine County:											
Aurum	2		346	4		4	670	31,900	9,100		8,609
Bald Mountain	1		2				2	200			44
Black Horse	1		3				225				204
Cherry Creek	5		534	89		89	2,672	4,100			6,386
Duck Creek	1		4				10		4,700		643
Newark	2		146				2,224	100	3,900	1,400	2,760
Osceola	4	3	707	623	102	725	382				25,720
Robinson	23		6,699,054	49,878		49,878	160,416	[11] 104,173,500	186,500	875,800	23,708,544
Taylor	2		411	6		6	6,046				5,682
Tungstonia	1		1	2		2	4		100		88
Ward	1		18	1		1	399	900	3,100	2,000	1,285
White Cloud	1		11				19		2,700	100	396
White Pine (Hamilton)	12		2,774	11		11	10,471	20,800	554,000	57,600	97,157
Undistributed[10]			343,108	44,613	35,398	80,011	102,925	247,900	599,300	342,700	3,074,669
Total Nevada	325	25	[5 8] 7,745,119	[5 9] 142,069	36,378	[5 9] 178,447	[5 9] 1,537,217	[5 9 11] 105,138,000	[5 9] 18,816,000	[5 9] 43,212,000	[5 9] 38,181,872

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Source of silver as follows: 1,527,417 ounces from lode mines and 9,800 ounces from placers.
[3] Included with "Undistributed" in order to avoid disclosure of individual company operations.
[4] From property not classed as a mine.
[5] Includes 2,197 tons of ore and contained recoverable metal from the former Metals Reserve Co. stockpile at Jean, Nev.
[6] Battle Mountain district lies in Humboldt and Lander Counties.
[7] Exclusive of placer output which is included with "Undistributed."
[8] Excludes tungsten ore.
[9] Includes metal recovered from tungsten ore.
[10] Includes values and quantities which cannot be shown separately for certain individual districts as indicated in the appropriate column by footnote reference 4.
[11] Includes 799,500 pounds contained in precipitates.

Yellow Pine (Goodsprings) District.—J. W. Stewart milled 200 tons of ore from the Anchor mine in January 1950; 19 tons of jig and table concentrate containing (gross) 140 ounces of silver, 28 pounds of copper, 22,160 pounds of lead, and 1,610 pounds of zinc was shipped to a smelter. L. F. Jacobson operated the Yellow Pine mine and shipped 1,054 tons of zinc-lead ore to smelters. Other mines worked in the district included the Bullion (R. K. Hamilton), Combination group (Otto & Milton Schwartz), Honduras group (Honduras Mining Co.), Root Zinc mine (Bonanza Hills Mines). Zinc ore (2,197 tons containing (gross) 18 ounces of gold, 10,622 ounces of silver, 18,164 pounds of copper, 97,250 pounds of lead, and 1,123,844 pounds of zinc) was shipped to a slag-fuming plant from the former Metals Reserve Company stockpile at Jean.

DOUGLAS COUNTY

Buckskin District.—Jesse R. Wilson worked the Buckskin mine from April 25 to June 29, 1950, and shipped 33 tons of ore containing (gross) 7 ounces of gold, 15 ounces of silver, and 2,080 pounds of copper to smelters.

ELKO COUNTY

Delano District.—McFarland & Hullinger worked the Cleveland and Delno mines during 1950 and shipped 2,512 tons of lead ore to smelters.

Edgemont (Centennial) District.—Silas Cordes shipped 61 tons of ore containing (gross) 3 ounces of gold, 2,326 ounces of silver, 959 pounds of copper, 3,847 pounds of lead, and 632 pounds of zinc to smelters.

Railroad (Bullion) District.—Lead & Copper Mines, Inc. (Uhalde & Parker), operated the Aladdin mine in 1950 and shipped lead-copper ore to smelters. Gregory Bros. shipped 8 tons of ore containing (gross) 2 ounces of gold, 61 ounces of silver, and 1,961 pounds of copper to a smelter from the Sweepstakes mine.

Ruby Range District.—O. J. Streeter shipped 13 tons of ore containing (gross) 69 ounces of silver, 38 pounds of copper, 6,600 pounds of lead, and 228 pounds of zinc to a smelter from the Summit View claims.

ESMERALDA COUNTY

Divide District.—Tonopah Divide Mining Co. and lessees recovered 59 ounces of gold and 1,375 ounces of silver from 146 tons of ore shipped to a smelter.

Goldfield District.—Goldfield Deep Mines Co. of Nevada and leasing companies worked the Deep Mines group throughout 1950. A substantial quantity of gold and some silver and copper were produced from flotation concentrates shipped to a smelter.

Lida District.—John Loncar operated the Gold Bar and Colorado claims in 1950 and shipped 14 tons of ore, which grossed 0.4 ounce of gold, 40 ounces of silver, 54 pounds of copper, 2,437 pounds of lead, and 8,475 pounds of zinc, to a concentrator-smelter.

Montezuma District.—Pacific Buttes Mining Co. worked the New York-Eva group in 1950 and shipped lead ore containing gold, silver, and copper to smelters.

EUREKA COUNTY

Antelope District.—Hugh M. Baldwin and Associates shipped 43 tons of ore containing (gross) 0.213 ounce of gold, 47 ounces of silver, 11,179 pounds of lead, and 17,324 pounds of zinc to a concentrator-smelter from the Baldwin mine in 1950.

Eureka District.—Hammond & Partners worked the Diamond (Eureka Prospect) mine from May through December 1950 and shipped 115 tons of ore containing in gross metal, 31 ounces of gold, 3,670 ounces of silver, 319 pounds of copper, 28,734 pounds of lead, and 3,040 pounds of zinc to a smelter. The Lone Mountain Lease shipped 689 tons of zinc ore, which averaged (gross) 30 percent zinc, from the Mountain View mine to a slag-fuming plant in 1950. Other mines worked included the Doe Run group (Owen Rice), the Eureka Mines, Inc., group, and the Extension mine (Cardinalli & Frank).

HUMBOLDT COUNTY

Potosi District.—Getchell Mine, Inc. operated the Getchell mine and Pinson-Ogee lease in 1950 recovering a substantial quantity of gold and some silver from ore milled at the company 1,500-ton flotation-cyaniding plant.[5]

LANDER COUNTY

Battle Mountain District.—The Natomas Co. operated its Natomas-type electric bucket-line dredge at Greenan Placers throughout 1950. According to the company annual report, good recovery of values was made under severe operating conditions. Copper Canyon Mining Co. worked the Copper Canyon mine from January 1 to June 5, 1950, when a shaft fire rendered the mine and mill inoperable; 31,610 tons of ore milled at the company 350-ton flotation plant yielded 1,661 tons of concentrate containing (gross) 475 ounces of gold, 75,504 ounces of silver, 59,600 pounds of copper, 1,129,000 pounds of lead, and 543,680 pounds of zinc. The plant was operated on Copper Basin ore from September 13 to December 31, and 2,780 tons milled yielded 116 tons of concentrate, which grossed 41 ounces of gold, 507 ounces of silver, and 27,760 pounds of copper.

Bullion District.—The London Extension Mining Co. operated the Goldacres open-pit mine throughout 1950 and recovered gold and silver by cyanidation.

New Pass District.—Reorganized Silver King Divide Mining Co. worked the Thomas W-Gold Belt group from May 1 to September 30, 1950; 1,697 tons of ore yielded 424 ounces of gold and 58 ounces of silver by amalgamation and 5 tons of concentrate (containing (gross) 107 ounces of gold and 277 ounces of silver) which was shipped to a smelter.

LINCOLN COUNTY

Comet District.—Comet Mines, Inc., worked the Comet mine from January 1 to August 14, 1950, and shipped 616 tons of ore containing (gross) 47 ounces of gold, 2,187 ounces of silver, 3,776

---

[5] *See* Engineering and Mining Journal, vol. 151, No. 7, July 1950, pp. 60–62.

pounds of copper, 32,642 pounds of lead, and 124,072 pounds of zinc to custom mills.

Groom District.—Dan Sheahan operated the Groom mine in 1950 and milled 2,731 tons of ore, containing (gross) 1,356 ounces of silver, and 223,940 pounds of lead at the mine's 50-ton gravity and flotation plant; 126 tons of concentrate was shipped to a smelter.

Jack Rabbit District.—Bristol Silver Mines Co. worked the Bristol mine in 1950 and shipped to a smelter ore containing values in gold, silver, copper, lead, and zinc.

Pioche (Highland) District.—The Combined Metals Reduction Co. in 1950 received 5 percent more company ore but 4 percent less custom ore at the Caselton mill than in 1949. Company zinc-lead ore was derived from the Pioche group; some contained manganese and was stockpiled. Custom zinc and zinc-lead ores from Nevada came principally from the Ely Valley Mines, Inc., Ely Valley mine, which operated throughout 1950. The mill products were lead and zinc concentrates which were shipped to smelters.

LYON COUNTY

Silver City District.—Leo K. Johnson worked the Buckeye mine from January to September 1950 and shipped 292 tons of ore, which averaged 0.69 ounce of gold and 1.33 ounces of silver per ton to a custom mill. Other mines active in 1950 included the Dayton, Hayward, Silver City, and Three Brothers.

Wellington District.—Hatfield Goudey operated the Jack Pot mine in 1950 and shipped to smelters 40 tons of zinc-lead ore containing (gross) 1.81 ounces of gold, 83 ounces of silver, 740 pounds of copper, 6,193 pounds of lead, and 8,204 pounds of zinc and 141 tons of lead ore containing 0.52 ounce of gold, 229 ounces of silver, 1,959 pounds of copper, 20,401 pounds of lead.

Yerington District.—John Regan shipped to a smelter in 1950 21 tons of ore containing (gross) 74 ounces of silver, 1,308 pounds of copper, 4,444 pounds of lead, and 5,854 pounds of zinc from the Santa Cruz mine, ½ mile west of Mason.

MINERAL COUNTY

Aurora District.—Chessher & Co. worked the Chesco mine from January to October 1, 1950. Ore, amalgamated at the company mill, and concentrate, some of which was cyanided at a custom plant and the rest smelted, yielded substantial quantities of gold and silver.

Candelaria (Columbus) District.—G. A. Peterson operated the New Potosi mine in 1950 and with C. A. Wethern, lessee, shipped 1,842 tons of ore containing (gross) 457 ounces of gold, 20,531 ounces of silver, 1,104 pounds of copper, 243,014 pounds of lead, and 14,011 pounds of zinc to smelters.

East Walker District.—John Regan shipped 28 tons of ore containing (gross) 0.69 ounce of gold, 236 ounces of silver, 221 pounds of copper, 3,316 pounds of lead, and 276 pounds of zinc from the Empire mine to a smelter in 1950.

NYE COUNTY

Manhattan District.—Robert Selig worked the Sunshine mine during 1950; 175 tons of ore amalgamated at the mine 25-ton mill yielded 77 ounces of gold and 37 ounces of silver. Other mines operated in 1950 included the Baxter dump, Gold Metals group, Jumbo, Keystone group, Manhattan and Stray Dog (lode mines), and the Georgie group, Ajax, Jim, Jack, Jumbo, and Lucky Strike (placer mines).

Quartz Mountain District.—Douglas, Hill & Chiatovich worked the San Rafael mine from January 20 to December 31, 1950; 250 tons of ore milled at the 20-ton gravity mill yielded 21 tons of concentrate containing (gross) 1 ounce of gold, 835 ounces of silver, 135 pounds of copper, 15,506 pounds of lead, and 2,400 pounds of zinc. In addition, 861 tons of direct-smelting ore shipped contained 27 ounces of gold, 8,815 ounces of silver, 3,482 pounds of copper, 173,375 pounds of lead, and 16,975 pounds of zinc.

Round Mountain District.—Round Mountain Gold Dredging Corp. successfully worked the Round Mountain talus throughout 1950. Placer material was loaded by a 7-cubic-yard electric power shovel and belt-conveyed to the treatment plant, also electrically powered. Substantial quantities of gold and silver were recovered.

PERSHING COUNTY

Trinity (Arabia) District.—J. H. and Harry Green worked the G. W. claims for 9 months in 1950; 45 tons of ore shipped to a smelter contained (gross) 1.68 ounces of gold, 622 ounces of silver, 90 pounds of copper, and 12,089 pounds of lead.

Willow Creek District.—Wallace Calder operated a gasoline power shovel and trommel at the Wadley mine from July through September 1950; 7,900 cubic yards of gravel washed yielded 56 ounces of gold and 29 ounces of silver.

STOREY COUNTY

Comstock District.—Central Comstock Mines Corp. treated 48,808 tons of old tailings by cyanidation in 1950 and recovered substantial quantities of gold and silver. Dayton Consolidated Mines Co. operated its cyanide plant from January to September. The plant treated custom ores from various mining districts in Nevada and California, in addition to ore from the company-operated Consolidated Virginia, Justice, Keystone, Woodville, and Dayton (Lyon County) mines. Double King Mines, Inc. (W. M. Donovan), worked the Silver Hill open-pit mine from January to August 15, 1950, and cyanided 4,803 tons of ore in the company 100-ton mill at Silver City, Lyon County. Consolidated Chollar, Gould & Savage Mining Co. cyanided 42,482 tons of ore from the Overman open-pit mine from January 1 to July 10, 1950.

WASHOE COUNTY

Olinghouse (White Horse) District.—Mines operated during 1950 included the Butte (Jimmie D. More), Cabin No. 2, Texas No. 1 & Hutchinson (Emile Cabanne), Margaret Ext. (E. J. Cleary & A. J. Daniels), Monarch & Texas No. 3 (Roy Garrison), Renegade (G. W. De La Mare), and Texas No. 2 (R. B. Clemmons). Gold and silver were recovered by amalgamation.

WHITE PINE COUNTY

Aurum District.—Grand Deposit Mining Co. and lessees worked the Grand Deposit and the Kansas mines in 1950; 23 tons of lead ore containing (gross) 85 ounces of silver, 223 pounds of copper, 9,477 pounds of lead, and 1,830 pounds of zinc and 323 tons of copper ore containing 4 ounces of gold, 595 ounces of silver, and 32,388 pounds of copper were shipped to smelters.

Osceola District.—R. H. States & Hazel Green worked the Mary Ann placer drift mine throughout 1950; 110 cubic yards of gravel yielded 35 ounces of gold and 6 ounces of silver. Graham Development Corp. shipped 518 tons of ore containing (gross) 584 ounces of gold and 257 ounces of silver to a smelter from the Golden Eagle claim.

Robinson District.—The Kennecott Copper Corp. (Nevada Mines Division) operated the Ruth Pit and the Ruth Pit Extension, the latter for the account of Consolidated Coppermines Corp., throughout 1950. The ore was treated at Kennecott's McGill 18,000-ton-daily-capacity flotation concentrator and the copper concentrates smelted at the McGill reduction plant. The Consolidated Coppermines Corp. readied the Morris Brooks Pit for production and shipped lead ore and zinc ore to smelters from 10 lessee-operated claims in 1950. Sam M. Robison worked the Columbia group throughout 1950; 1,500 tons of ore concentrated by jigging yielded 39 tons of concentrate containing (gross) 1 ounce of gold, 107 ounces of silver, 157 pounds of copper, 32,960 pounds of lead, and 2,853 pounds of zinc. In addition, 1,639 tons of ore shipped to smelters and a slag-fuming plant contained (gross) 51 ounces of gold, 5,374 ounces of silver, 12,214 pounds of copper, 137,975 pounds of lead, and 422,864 pounds of zinc.

Ward District.—The O. B. Mining Co. worked the Pleadis and Good Luck claims from July 1 to November 9, 1950; 18 tons of ore shipped to a smelter contained (gross) 0.55 ounce of gold, 399 ounces of silver, 1,093 pounds of copper, 3,133 pounds of lead, and 2,768 pounds of zinc.

White Pine (Hamilton) District.—Andrew Siri and Alma Gubler operated the Great Valley mine throughout 1950; 190 tons of ore containing (gross) 1 ounce of gold, 1,613 ounces of silver, 12,478 pounds of copper, 82,224 pounds of lead, and 10,660 pounds of zinc were shipped to smelters. Kidder & King and lessees worked the Onetha and Ora claims from March 7 to November 17, 1950, and shipped ore with values in silver, copper, lead, and zinc to smelters.

New Mexico

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By A. J. Martin

GENERAL SUMMARY

EXTRAORDINARY demand for metals engendered by expanding industrial activity and the Korean conflict led to a sharp upturn in production of copper, lead, and zinc in New Mexico during the latter half of 1950. Prices of all three metals moved upward as the demand grew, and the average yearly zinc price was the highest on record. Five of the six major zinc-producing mines that shut down when the price of zinc declined in 1949 reopened in 1950—one on February 27, three in June, and one on October 16. However, return to the 1948 monthly production rate for zinc and lead in the State was delayed beyond the end of the year by a work stoppage, beginning October 17, that closed one mine and mill and caused several other mines served by the mill to suspend ore shipments temporarily. The large Chino open-pit copper mine in Grant County operated continuously and extended working time from 6 to 7 days a week in June. The Bonney-Miser's Chest underground copper mine in Hidalgo County worked steadily and expanded output materially.

The State production of copper increased 20 percent in quantity and 26 percent in value compared with 1949. Zinc output, although nearly the same in quantity as in 1949, rose 14 percent in value because of the advance in the average zinc price. Lead production declined 11 percent in quantity and 24 percent in value, the average price of lead dropping nearly 15 percent, as the price did not rise above 12 cents a pound until August 15, and it was October 31 before the year's high of 17 cents was quoted. Nearly all the gold and silver output was recovered as a byproduct from base-metal ores; gold production increased 5 percent from 1949, and silver output decreased 11 percent. The total value of the five metals was $37,437,915 in 1950 compared with $31,029,120 in 1949.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

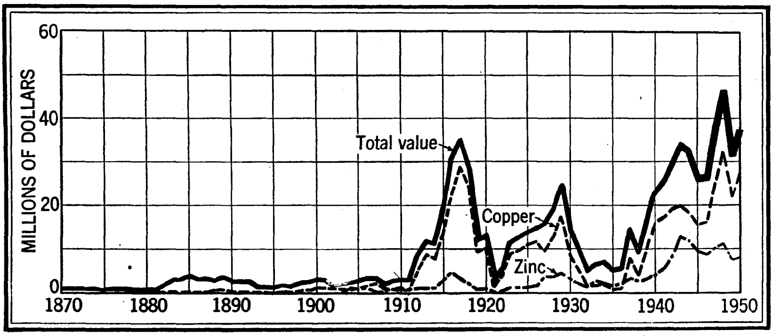

FIGURE 1.—Value of mine production of copper and zinc and total value of gold, silver, copper, lead, and zinc in New Mexico, 1870–1950. The value of gold, silver, and lead produced annually has been relatively small.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	332	28,215	4,718	143	830
February	275	14,310	5,271	160	830
March	225	19,229	5,759	192	1,555
April	268	18,147	4,895	109	1,645
May	133	17,195	4,680	102	1,917
June	130	18,645	5,340	162	1,671
July	366	25,434	5,320	365	3,410
August	217	35,579	5,964	574	4,187
September	185	30,000	6,375	417	3,823
October	300	46,293	6,160	664	3,408
November	487	47,590	6,051	686	3,000
December	496	37,944	5,767	576	2,987
Total: 1950	3,414	338,581	66,300	4,150	29,263
1949	3,249	380,855	55,388	4,652	29,346

Table 3 shows the number of mines in New Mexico producing gold, silver, copper, lead, and zinc and their annual output of ore and metals from 1946 to 1950, as well as the total production from 1848 to 1950. The report of this series for 1929 (chapter of Mineral Resources of the United States, 1929, pt. 1, pp. 729–759) gives the yearly production of each important metal-producing district in New Mexico from 1904 to 1929, inclusive. Subsequent data, year by year, may be found in annual issues of Mineral Resources and Minerals Yearbook.

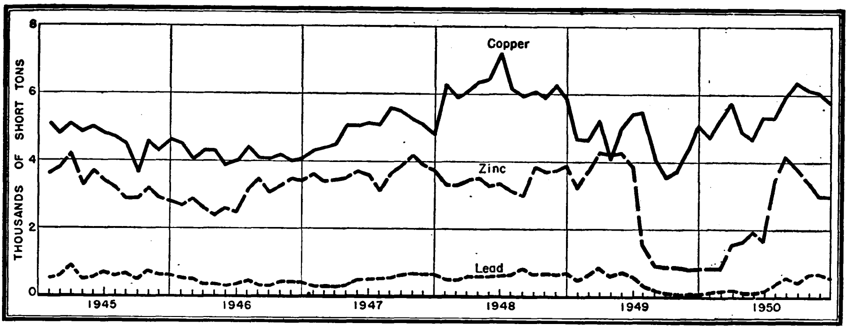

FIGURE 2.—Mine production of copper, lead, and zinc in New Mexico, by months, 1945-50, in terms of recoverable metal.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in New Mexico, 1946-50, and total, 1848-1950, in terms of recoverable metal [1]

Year	Mines producing		Ore (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1946	50	4	6,594,890	4,009	$140,315	338,000	$273,104
1947	82	3	7,352,945	3,146	110,110	515,833	466,829
1948	91	2	7,733,163	3,414	119,490	537,674	486,622
1949	77	3	6,539,602	3,249	113,715	380,855	344,693
1950	78	2	7,899,054	3,414	119,490	338,581	306,433
1848-1950	----------	----------	(2)	2,196,058	50,196,223	69,527,674	54,549,775

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	50,191	$16,261,884	4,899	$1,067,982	36,103	$8,809,132	$26,552,417
1947	60,205	25,286,100	6,383	1,838,304	44,103	10,672,926	38,374,269
1948	74,687	32,414,158	7,653	2,739,774	41,502	11,039,532	46,799,576
1949	55,388	21,822,872	4,652	1,470,032	29,346	7,277,808	31,029,120
1950	66,300	27,580,800	4,150	1,120,500	29,263	8,310,692	37,437,915
1848-1950	1,606,779	505,532,647	297,679	35,724,509	989,154	163,329,150	809,332,304

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Figure not available.

TABLE 4.—Gold and silver produced at placer mines in New Mexico, 1945-50, in terms of recoverable metal

Year	Gold		Silver		Total value	Year	Gold		Silver		Total value
	Fine ounces	Value	Fine ounces	Value			Fine ounces	Value	Fine ounces	Value	
1945	15	$525	7	$5	$530	1948	9	$315	2	$2	$317
1946	10	350	2	2	352	1949	31	1,085	9	8	1,093
1947	23	805	10	9	814	1950	6	210	--------	--------	210

Gold.—The New Mexico output of gold in 1950 was 3,414 fine ounces, of which 2,942 ounces was recovered as a byproduct from base-metal ores (mostly copper ore) and 472 ounces was derived from dry gold and silver ores and placer gravel.

Silver.—Production of silver in New Mexico in 1950 totaled 338,581 fine ounces. Zinc and zinc-lead ores yielded 51 percent of the total silver, copper ore yielded 38 percent, lead and lead-copper ores 2 percent, and silver and gold ores 9 percent. The principal producers of silver were the Bonney-Miser's Chest copper mine in Hidalgo County and the Ground Hog zinc-lead mine and Hanover (Empire Zinc) zinc mine in Grant County.

Copper.—New Mexico's output of recoverable copper in 1950 was 66,300 tons compared with 55,388 tons in 1949 and an average of 65,712 tons annually for the 10-year period 1939–48. As usual, most of the State output of copper came from the Chino open-pit mine of the Kennecott Copper Corp. at Santa Rita, Grant County. The Banner Mining Co. Bonney-Miser's Chest mine in Hidalgo County was a

MINE PRODUCTION BY COUNTIES

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Catron	2		41	$1,435	1,148	$1,039
Dona Ana	3		1	35	1,687	1,527
Grant	23	2	2,297	80,395	201,075	181,983
Guadalupe	1				41	37
Hidalgo	20		714	24,990	96,295	87,152
Lincoln	2		48	1,680	43	39
Luna	5		1	35	336	304
Otero	1				9	8
Sandoval	2				10	9
Santa Fe	2		63	2,205	643	582
Sierra	8		124	4,340	1,033	935
Socorro	9		125	4,375	36,261	32,818
Total: 1950	78	2	3,414	119,490	338,581	306,433
1949	77	3	3,249	113,715	380,855	344,693

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Catron							$2,474
Dona Ana	15	$6,240	8	$2,160	256	$72,704	82,666
Grant	63,703	26,500,448	2,569	693,630	27,324	7,760,016	35,216,472
Guadalupe	320	133,120	8	2,160			135,317
Hidalgo	2,062	857,792	155	41,850	4	1,136	1,012,920
Lincoln							1,719
Luna			5	1,350			1,689
Otero	1	416	24	6,480			6,904
Sandoval	3	1,248					1,257
Santa Fe	23	9,568					12,355
Sierra	2	832	4	1,080			7,187
Socorro	171	71,136	1,377	371,790	1,679	476,836	956,955
Total: 1950	66,300	27,580,800	4,150	1,120,500	29,263	8,310,692	37,437,915
1949	55,388	21,822,872	4,652	1,470,032	29,346	7,277,808	31,029,120

substantial producer. The Atwood mine in Hidalgo County and the Stauber in Guadalupe County shipped considerable copper ore directly to the El Paso smelter.

Lead.—The quantity of recoverable lead produced in New Mexico in 1950 was 4,150 tons compared with 4,652 tons in 1949. Although 15,727 tons of low-grade lead ore was mined in the Hansonberg (Oscura Mountains) district in Socorro County in 1950, most of the State output of lead came from zinc and zinc-lead mines in the Central and Magdalena districts. The principal producers of lead in 1950 were the Ground Hog mine (Central district), Lynchburg (Magdalena district), Bayard (Central district), and Portales (Hansonberg district).

Zinc.—Most of the mines in New Mexico that closed in 1949 as a result of the drastic decline in the price of zinc reopened in 1950, when the price rose from 9.75 cents a pound to 17.5 cents between March 13 and September 7. In the Central district, the New Mexico Consolidated Mines Co. Kearney mine resumed operations February 27; the Kennecott Copper Corp. Oswaldo mine, the American Smelting & Refining Co. Ground Hog, and the United States Smelting, Refining & Mining Co. Bayard reopened in June; and the Peru Mining Co. Pewabic reopened October 16. The Hanover mine and mill of the New Jersey Zinc Co., Empire Zinc Division, which had operated throughout 1949, were shut down by a work stoppage October 17, 1950, and remained idle the rest of the year. The shut-down of the mill caused the Oswaldo and several other mines served by the mill to suspend ore shipments temporarily. The State output of recoverable zinc, of which 92 percent came from the Central district, was 29,263 tons compared with 29,346 tons in 1949. The principal producers of zinc in 1950, in order of output, were the Kearney, Hanover (Empire Zinc), Ground Hog, Oswaldo, and Bayard groups.

MINING INDUSTRY

The Chino open-pit copper mine of the Kennecott Copper Corp. at Santa Rita, Grant County, is the largest single mining enterprise in New Mexico. About 45,000 tons of combined ore and waste rock are removed from the pit daily. Around 800 men are employed at the mine and 1,000 at the treatment plants and offices at Hurley; in addition, 200 people work at the hospital and other company-supported projects. The Bonney-Miser's Chest and Atwood underground mines in Hidalgo County and the Stauber in Guadalupe County also produced copper ore in 1950. The tonnage of copper ore mined in the State increased 23 percent from 1949. The combined tonnage of lead and zinc ores decreased 11 percent despite reopening of most of the mines that closed in 1949; a labor strike that shut down the Hanover (Empire Zinc) mine and mill October 17 prevented a return to full production during 1950. Deep development of zinc-lead ore bodies of the Ground Hog mine in the Central district continued, and one shaft reached a depth of 2,210 feet, making it probably the deepest mine shaft in New Mexico. The Bureau of Mines did exploratory drilling on a low-grade copper deposit in the Organ district and a zinc-lead deposit in the Cerrillos district.

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by class of ore or other source material, with content in terms of recoverable metal

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	11	935	182	378	739	1,912	----------
Dry gold-silver ore	5	1,224	270	12,741	3,698	5,800	----------
Dry silver ore	8	3,925	14	18,822	4,699	80,516	----------
Total	24	6,084	466	31,941	9,136	88,228	----------
Copper ore	14	7,510,499	2,587	127,455	[2] 131,918,424	150,027	----------
Lead ore	31	18,045	58	6,122	11,530	1,379,504	5,000
Lead-copper ore	1	56	2	507	3,000	18,989	----------
Zinc ore	12	335,703	265	135,023	604,066	4,616,833	55,027,500
Zinc-lead ore	7	28,667	30	37,533	53,844	2,046,419	3,493,500
Total	58	7,892,970	2,942	306,640	[2] 132,590,864	8,211,772	58,526,000
Total lode mines	78	7,899,054	3,408	338,581	[2] 132,600,000	8,300,000	58,526,000
Gravel (placer operations)	2	----------	6	----------	----------	----------	----------
Total: 1950	80	7,899,054	3,414	338,581	[2] 132,600,000	8,300,000	58,526,000
1949	80	6,539,602	3,249	380,855	[2] 110,776,000	9,304,000	58,692,000

[1] Detail will not necessarily add to totals because some mines produce more than one class of ore.
[2] Includes copper contained in precipitates recovered from mine water and leached dumps as follows: 1950—33,060,113 pounds of copper; 1949—30,789,314 pounds of copper.

METALLURGICAL INDUSTRY

Four flotation mills treated 98 percent of the zinc and zinc-lead ores mined in New Mexico in 1950. These mills were the 1,000-ton Peru mill and the new 400-ton American Smelting & Refining Co. mill at Deming; the Empire Zinc Co. mill at Hanover; and the United States Smelting, Refining & Mining Co. 600-ton mill at Bayard. A small mill at the Hornet mine at Hachita also treated zinc-lead ore. Copper ore was treated in the 20,000-ton (rated capacity) Chino concentrator at Hurley and the 500-ton Banner Mining Co. mill near Lordsburg. Lead ore from the Hansonberg (Oscura Mountains) district was concentrated in the jig mill built in 1950 at the Major Jones mine and in the Portales mill at San Antonio.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	6	----------	----------	----------	----------
Amalgamation	90	35	----------	----------	----------
Smelting of ore	1,059	89,562	2,277,887	798,447	70,900
Smelting of concentrate	2,259	248,984	97,262,000	7,501,553	58,455,100
Smelting of precipitate (copper)	----------	----------	33,060,113	----------	----------
Total: 1950	3,414	338,581	132,600,000	8,300,000	58,526,000
1949	3,249	380,855	110,776,000	9,304,000	58,692,000

The Chino smelter of the Kennecott Copper Corp. at Hurley treated concentrates from the Chino mill, siliceous copper ore (used as a flux) from the Chino mine, and copper precipitates from company operations at Chino and Ray, Ariz. The smelter produces fire-refined copper and some blister copper. Direct-smelting ore and lead and copper concentrates from other New Mexico operations were shipped to smelters in Texas, Arizona, and Kansas. Zinc concentrates were shipped to smelters in Illinois, Montana, Pennsylvania, and Texas.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by method of recovery (except placer) and class of ore[1] processed, in terms of recoverable metal

A. For ore treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Dona Ana	1,632			515	1	1,476	27,808	9,987	512,000
Grant	7,689,037	19	6	312,179	1,913	173,029	[2]126,445,086	5,066,546	54,648,000
Hidalgo	63,462			7,241	306	57,104	3,799,158	28,920	8,000
Lincoln	540	29	22						
Santa Fe	150			9	12	3	121		
Sierra	84	42	7						
Socorro	36,764			5,138	27	17,372	49,940	2,396,100	3,287,100
Total: 1950	7,791,669	90	35	325,082	2,259	248,984	[1]130,322,113	7,501,553	58,455,100
1949	6,442,316	9	7	284,402	1,621	242,479	[1]109,091,270	8,670,725	58,691,246
BY CLASS OF ORE TREATED									
Dry gold	774	90	35	9	12	3	121		
Copper	7,411,076			260,687	1,951	76,227	[1]129,665,986		
Lead	15,948			672	3	1,738	1,956	928,601	5,000
Zinc	335,692			58,442	265	134,987	603,866	4,615,733	55,020,800
Zinc-lead	28,179			5,272	28	36,029	50,184	1,957,219	3,429,300
Total 1950	7,791,669	90	35	325,082	2,259	248,984	[1]130,322,113	7,501,553	58,455,100

B. For ore shipped directly to smelters

	Ore (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Catron	123	41	1,148			
Dona Ana	111		211	2,192	6,013	
Grant	72,317	359	28,040	960,914	71,454	
Guadalupe	18,469		41	640,000	16,000	
Hidalgo	10,942	408	39,191	324,842	281,080	
Lincoln	53	19	21			
Luna	91	1	336		10,000	
Otero	486		9	2,000	48,000	
Sandoval	465		10	6,000		
Santa Fe	117	51	640	45,879		
Sierra	67	82	1,026	4,000	8,000	
Socorro	4,144	98	18,889	292,060	357,900	70,900
Total: 1950	107,385	1,059	89,562	2,277,887	798,447	70,900
1949	97,286	1,588	138,360	1,684,730	633,275	754

[1] No old tailings processed in 1950.
[2] Copper contained in precipitates recovered from mine water and leached dumps is included with that in copper concentrates as follows: 1950, 33,060,113 pounds of copper; 1949, 30,789,314 pounds of copper.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Gold	9	12	3	125		
Copper	260,687	6,707	121,011	[1]133,779,391		
Lead	5,882	174	125,827	192,484	7,031,381	752,795
Lead-copper	7	1	927	3,200	8,724	2,000
Zinc	58,497	130	52,918	621,593	869,300	65,018,404
Total: 1950	325,082	7,024	300,686	[1]134,596,793	7,909,405	65,773,199
Total: 1949	284,402	5,839	308,545	[1]114,081,175	9,197,484	65,809,548
ORE SHIPPED TO SMELTERS						
Dry gold	161	80	340	536	3,071	
Dry gold-silver	1,224	270	12,741	3,878	9,593	
Dry silver	3,925	14	18,822	5,155	86,821	
Copper	99,423	636	51,228	2,700,508	251,653	
Lead	2,097	55	4,384	12,212	469,904	
Lead-copper	56	2	507	3,656	19,709	
Zinc	11		56	220	1,812	7,571
Zinc-lead	488	2	1,504	4,142	92,905	82,294
Total: 1950	107,385	1,059	89,582	2,730,307	935,468	89,865
Total: 1949	97,286	1,588	138,360	1,995,731	821,824	1,616

[1] Copper contained in precipitates recovered from mine water and leached dumps is included with that in copper concentrates as follows: 1950, 33,885,754; 1949, 31,408,905 pounds of copper.

REVIEW BY COUNTIES AND DISTRICTS

CATRON COUNTY

Mogollon (Cooney) District.—Mathis & Mathis worked the Lehigh Metals Co. Fanney Consolidated group from January 1 through March 6, 1950, and shipped 118 tons of ore containing 32 ounces of gold and 1,120 ounces of silver. At the Big John mine about 55 tons of ore were mined with hand tools. The mill-grade rock was stockpiled at the mine and 5 tons of ore containing 9 ounces of gold, 28 ounces of silver, and 45 pounds of copper[1] were packed 2 miles on burros to a road and trucked to smelters.

DONA ANA COUNTY

Organ District.—The Merrimac mine was operated under lease by Wade White and Ira L. Wright from July through December. The ore shipped (1,632 tons) averaged 18.44 percent zinc and contained also silver, copper, and lead. J. H. Brown shipped sample lots of copper-silver ore from the Torpedo group and lead-silver ore from the Bennett-Stephenson. The Bureau of Mines completed its Torpedo Copper diamond-drilling research project in April.

[1] No output of recoverable copper is shown for Catron County in 1950 because the quantity produced was too small to be tabulated in rounded figures.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in New Mexico in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore sold or treated (short tons)	Gold (fine ounces)		
	Lode	Placer		Lode	Placer	Total
Catron County: Mogollon	2	----------	123	41	----------	41
Dona Ana County: Organ	3	----------	1,743	1	----------	1
Grant County:						
Central [1]	11	----------	7,747,374	2,007	----------	2,007
Eureka	2	----------	6,036	4	----------	4
Lone Mountain	1	----------	2,819	14	----------	14
Pinos Altos	3	2	2,407	4	6	10
Steeple Rock	2	----------	855	259	----------	259
Swartz	4	----------	1,863	3	----------	3
Guadalupe County: Pintado	1	----------	18,469	----------	----------	----------
Hidalgo County:						
Gillespie (Red Hill)	1	----------	936	----------	----------	----------
Lordsburg	14	----------	73,349	714	----------	714
San Simon	5	----------	119	----------	----------	----------
Lincoln County:						
Nogal (Bonita)	1	----------	400	9	----------	9
White Oaks	1	----------	193	39	----------	39
Luna County:						
Cooks Peak	1	----------	5	----------	----------	----------
Tres Hermanas	2	----------	13	----------	----------	----------
Victorio	2	----------	73	1	----------	
Otero County: Sacramento	1	----------	486	----------	----------	----------
Sandoval County: Cuba (Nacimiento Mountains)	2	----------	465	----------	----------	----------
Santa Fe County: San Pedro (New Placers)	2	----------	267	63	----------	63
Sierra County:						
Chloride	3	----------	22	3	----------	3
Hermosa	1	----------	18	----------	----------	----------
Las Animas	4	----------	111	121	----------	121
Socorro County:						
Hansonberg	3	----------	15,727	3	----------	3
Magdalena	6	----------	25,181	122	----------	122
Total New Mexico	78	2	7,899,054	3,408	6	3,414

County and district	Silver [2] (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
Catron County: Mogollon	1,148	------------	------------	------------	$2,474
Dona Ana County: Organ	1,687	30,000	16,000	512,000	82,666
Grant County:					
Central [1]	151,480	[3] 127,388,000	4,629,500	53,793,500	34,967,706
Eureka	15,514	4,600	262,600	281,700	90,591
Lone Mountain	14,683	2,800	1,000	------------	14,496
Pinos Altos	4,656	6,200	132,800	287,100	64,550
Steeple Rock	11,004	1,300	1,700	------------	19,523
Swartz	3,738	3,100	110,400	285,700	59,606
Guadalupe County: Pintado	41	640,000	16,000	------------	135,317
Hidalgo County:					
Gillespie (Red Hill)	2,382	1,100	75,500	------------	12,578
Lordsburg	92,816	4,122,100	171,100	8,000	990,624
San Simon	1,097	800	63,400	------------	9,718
Lincoln County:					
Nogal (Bonita)	10	------------	------------	------------	324
White Oaks	33	------------	------------	------------	1,395
Luna County:					
Cooks Peak	9	------------	2,000	------------	278
Tres Hermanas	52	------------	2,000	------------	317
Victorio	275	------------	6,000	------------	1,094
Otero County: Sacramento	9	2,000	48,000	------------	6,904
Sandoval County: Cuba (Nacimiento Mountains)	10	6,000	------------	------------	1,257
Santa Fe County: San Pedro (New Placers)	643	46,000	------------	------------	12,355
Sierra County:					
Chloride	182	300	1,700	------------	562
Hermosa	360	100	6,300	------------	1,197
Las Animas	491	3,600	------------	------------	5,428
Socorro County:					
Hansonberg	1,337	1,500	902,800	4,000	124,073
Magdalena	34,924	340,500	1,851,200	3,354,000	832,882
Total New Mexico	338,581	[3] 132,600,000	8,300,000	58,526,000	37,437,915

[1] Includes Burro Mountain district, gold and silver figures for which Bureau of Mines is not at liberty to publish separately.
[2] All from lode mines.
[3] Includes copper recovered from precipitates.

GRANT COUNTY

Burro Mountain (Tyrone) District.—The Malone Darhasana Mining Co. drove 40 feet of drifts in its mine between Knight and Thompson Canyons and shipped some gold-silver ore.

Central (Bayard, Fierro, Georgetown, Hanover, Santa Rita) District.—The large Chino open-pit mine of the Kennecott Copper Corp. Chino Mines Division at Santa Rita operated continuously 6 days a week from January through May and 7 days the rest of 1950. The bottom level of the pit was about 400 feet below the lowest point on the rim and 845 feet below the highest point at the end of 1950. The distance across the pit at the widest point was 5,400 feet. A standard-gage railroad with 40 miles of track is used in the pit and on the dumps. Electric shovels handling 8 tons per dip are used on benches for loading ore and waste rock; about 45,000 tons of material, nearly half of which is ore, are generally handled daily. The ore is transferred from the mine railroad to the Atchison, Topeka & Santa Fe Railway branch line west of the pit for delivery to treatment plants at Hurley, 10 miles from the mine. The concentrator has a daily (maximum) capacity of 22,500 tons. Molybdenite is recovered in the mill as a byproduct. The copper concentrate is smelted in the company smelter adjacent to the mill. The smelter also treats precipitates derived from dump leaching and siliceous copper ore used as a flux. The copper bullion contains minor quantities of gold and silver, which are not recovered from fire-refined copper, the major product of the smelter; the blister copper made contains some recoverable gold and silver.

The Kennecott Copper Corp. Oswaldo zinc mine operated in 1950 from June 19 through December. The ore produced was shipped to the Hanover (Empire Zinc) mill until that mill was closed by a work stoppage October 17; most of the ore mined the rest of the year was stockpiled. During the year 2,101 feet of drifts and 132 feet of raises were driven. The total development in the Oswaldo mine at the end of 1950 comprised two vertical shafts 490 and 705 feet deep, 13,348 feet of drifts and crosscuts, and 772 feet of raises.

The Hanover mine of the New Jersey Zinc Co., Empire Zinc Division, the only large New Mexico zinc producer that operated throughout 1949, continued producing steadily in 1950 until October 17, when a labor strike (prolonged many months) shut down the mine and mill. As the mill treated custom ore in addition to company ore, its closing forced several other mines to suspend ore shipments or to seek other milling facilities.

The Kearney mine, operated by the New Mexico Consolidated Mining Co. (subsidiary of the Peru Mining Co.), was reopened February 27, 1950, and the Pewabic, operated by the Peru Mining Co., was reopened October 16; both mines had closed in June 1949 because of the low prices of zinc and lead. Development in the Kearney (opened by a 625-foot shaft) in 1950 included 1,335 feet of drifts and 4,530 feet of diamond drilling.

The Bayard mine of the United States Smelting, Refining & Mining Co. reopened in June 1950 after a year's shutdown caused by the decline in the price of zinc and lead in 1949. In 1950 the company 600-ton flotation mill operated from July 1 through December. Development during the year included 460 feet of raises, 1,283 feet of drifts and crosscuts, and 1,361 feet of diamond drilling.

The American Smelting & Refining Co. Ground Hog mine, which had suspended mining ore July 15, 1949, but continued development work, was active in development throughout 1950 and resumed mining operations June 20. Development in 1950 included 454 feet of shaft, 6,363 feet of drifts, raises, and crosscuts, and 9,940 feet of diamond drilling. The new three-compartment No. 5 shaft was extended to a depth of 2,210 feet and is probably the deepest mine shaft in New Mexico. The new four-compartment Star vertical shaft is 1,926 feet deep. The old North shaft is vertical to the 600-foot level and has a winze from there to the 1,800-foot level. The ore produced was shipped to the new company mill at Deming (see Luna County). The old Combination-Black Hawk mill, which formerly served the mine, was sold for dismantling.

Small-scale operators at the Betty Jo, Little Goat, and Jim Thayer mines shipped a total of 230 tons of ore.

Eureka District.—The Hornet mine, operated by Mineral Operations, Inc., produced from 20 to 35 tons of zinc-lead ore daily in 1950; the ore was concentrated in the company flotation mill at the mine. About a car of lead-silver ore was shipped from the Mairland claim.

Lone Mountain District.—Shipments of low-grade silver ore were continued from the Ben Hur-Mayflower property.

Pinos Altos District.—Mathis & Mathis operated the Houston-Thomas mine from June through December 1950 and shipped to the Peru mill near Deming 2,174 tons of ore containing 4,909 ounces of silver, 9,304 pounds of copper, 139,938 pounds of lead, and 334,884 pounds of zinc. Other small producers were the Langston and Geo. Schaffer mines.

Steeple Rock District.—L. H. Foster worked the Alabama group 9 months in 1950 and shipped 761 tons of ore containing 220 ounces of gold, 10,731 ounces of silver, and 901 pounds of copper. R. R. Rogers and Wm. McGuire, operating the Carlisle group, shipped 94 tons of ore containing 39 ounces of gold, 273 ounces of silver, and a little copper and lead.

Swartz (Carpenter, Camp Monarch) District.—The Royal John mine [2] was operated by lessees in 1950; the ore produced was shipped to custom mills at Hanover and Deming. The Patsy mine shipped about 700 tons of zinc ore. Some ore was shipped from the Aquilar and Luther M. Martin properties.

GUADALUPE COUNTY

Pintado District.—In 1950 Drunzer & Casner shipped 18,469 tons of siliceous copper ore from the Stauber mine to the El Paso smelter.

HIDALGO COUNTY

Gillespie (Red Hill) District.—Lessees at the Red Hill mine shipped 936 tons of silver-lead ore from the dump.

Lordsburg District.—The Banner Mining Co. stepped up production at its Bonney-Miser's Chest copper mine, equipped with a 500-ton flotation mill. The mill makes a 97-percent-plus recovery on the

[2] Soulé, John H., Investigation of the Royal John Lead-Zinc Deposits, Grant County, N. Mex.: Bureau of Mines Rept. of Investigations 4748, 1950, 14 pp.

copper. The ore was mined through the new Miser's Chest 1,191-foot vertical shaft. Development in 1950 included 10 feet of shaft, 1,212 feet of drifts, 1,003 feet of tunnel, and 2,018 feet of diamond drilling. The Atwood mine was worked in January, April, and May by C. H. and S. A. McIntosh and from July 27 through December under lease by Ira L. Moseley. The mine is opened by a three-compartment vertical shaft 792 feet deep and more than 4,000 feet of drifts and crosscuts on 4 levels. The ore produced contained copper, silver, lead, and gold and was shipped crude to the El Paso smelter. Other mines shipping a car or more of ore included the Anita, Last Chance, Lead Extension, Phoenix, and Ruth. Strong & Harris, Inc., continuing development at the Waldo mine, did 750 feet of drifting, 100 feet of raising, and 100 feet of diamond drilling.

San Simon District.—Some ore was shipped from the Bob Montgomery, Carbon Hill, Paint Horse, White Cloud, and World's Fair properties in 1950.

LINCOLN COUNTY

Nogal (Bonita, Parsons) District—Gold and silver were recovered by amalgamating ore from an open pit on the Pershing claim.

White Oaks District.—The Q. B. Q. Co., Inc., shipped a car of gold ore from the old North Homestake mine and recovered some gold and silver by amalgamation.

LUNA COUNTY

Cooks Peak District.—J. E. Price shipped 5 tons of lead-silver ore from the Johny claim.

Deming District.—The Peru Mining Co. operated its 1,000-ton selective lead-zinc flotation mill from March 15 through December 1950. The ore treated comprised 123,852 tons from the company's Kearney and Pewabic mines in the Central district and 2,573 tons of custom ore from other mines in Grant and Socorro Counties.

The American Smelting & Refining Co. completed its new 400-ton selective flotation mill at Deming in March 1950 and began operating it on a regular schedule July 6.[3] The mill served the company Ground Hog mine at Vanadium 46 miles northwest of Deming and also handled custom ore from 13 other mines, of which 9 were in New Mexico, 3 in Arizona, and 1 in Mexico. The mill features automatic sampling, efficiency of power consumption, ease of operation control, and economic high extraction of metals in treating zinc-lead-pyrite ore.

Tres Hermanas District.—Small tonnages of lead-silver ore were shipped from the Black Hawk No. 1 and Red Bird claims.

Victorio District.—About a car each of lead-silver ore was shipped from the Tungsten Hill and Virginia-Silver groups.

OTERO COUNTY

Sacramento District.—M. F. Drunzer shipped 486 tons of lead ore from the Warnock mine 9 miles south of High Rolls.

[3] Mining World, Deming—1950 Lead-Zinc Mill: September 1950, pp. 27–31.

SANDOVAL COUNTY

Nacimiento Mountains District.—Several hundred tons of low-grade copper ore was shipped from the Senorita mine, and 2 truckloads of 5-percent copper ore were shipped from the old San Miguel mine.

SANTA FE COUNTY

Cerrillos District.—The Bureau of Mines worked on a diamond-drilling research project on the Cash Entry group during May and June 1950. The mine was not in production during the year.

San Pedro or New Placers District.—Lessees at the San Pedro mine shipped 15 truckloads of copper-gold-silver ore. The Shamrock Gold Mining Co. worked on exploratory trenching and sampling on the Oro Quay group and remodeled its 25-ton mill at Golden. Ore milled for sampling yielded heavy iron sulfide concentrate, most of which was stockpiled at the mill; 9 tons, containing 12 ounces of gold and a little silver, copper, and lead, was shipped in 1950.

SIERRA COUNTY

Chloride (Apache, Cuchillo Negro) District.—Small lots of ore were shipped from the Big Bug, Dobies, and Minnehaha claims.

Hermosa (Lower Palomas Creek) District.—The Pelican mine was operated on a small scale by Ferguson & Jones.

Las Animas District.—The Anderson Extension, Bigelow, El Oro, and Snake gold mines produced small lots of ore.

SOCORRO COUNTY

Hansonberg District (Bingham).—The Portales Mining Co. open-pit lead mine was worked about 9 months in 1950 and produced 14,377 tons of ore, all trucked to the company mill at San Antonio for concentration. The Hurlow Mining & Milling Co. built a jig mill at the Major Jones open-cut lead mine and operated the mine and mill several months. The Mex-Tex Mining Co., Inc., did development on its lead-fluorspar-barite group (58 claims) and completed construction of a 500-ton mill near San Antonio designed to recover lead-silver concentrate, barite, and fluorspar as separate commercial products. Lead-silver concentrate was shipped in December. The new mill is adjacent to the company barite-grinding plant.

Magdalena District.—The Lynchburg mine of the New Jersey Zinc Co., Empire Zinc Division, operated under lease by C. S. Elayer, was the principal producer in the Magdalena district in 1950. The mine shipped zinc-lead-silver ore to custom mills in Grant and Luna Counties and copper-silver ore to the El Paso smelter. The 200-ton Waldo flotation mill of the American Smelting & Refining Co. was sold for dismantling; the Waldo zinc-lead mine was worked on a small scale by lessees. Other producers were the Juanita, Kelly, Nitt, and Queen mines.

Oregon

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By R. B. Maurer

GENERAL SUMMARY

REFLECTING the lower yield from dredging, Oregon gold production in 1950 fell 32 percent below 1949, whereas 1950 silver output, largely from lode mines, rose 11 percent over 1949. Zinc production increased 250 percent and lead 42 percent, but copper decreased 5 percent; the State's output of these three metals is minor, however.

Total value of the gold, silver, copper, lead, and zinc (in terms of recoverable metals) produced in Oregon was $417,765 in 1950 compared with $592,107 in 1949, a decrease of 29 percent. It was divided among the metals as follows: Gold, 93 percent; silver, 3 percent; and copper, lead, and zinc combined, 4 percent. Baker County was the leading metal producer in 1950, gaining slightly in gold and copper output, and supplied 54 percent of the State total value. Grant County, which fell to second place, owing largely to curtailed dredging, contributed 25 percent; Lane County, in third place by virtue of lode mining, 12 percent; and the other five producing counties, 9 percent.

Placer mines yielded 82 percent and lode mines 18 percent of Oregon gold produced in 1950. In 1949 the ratio was placer mines 89 percent and lode mines 11 percent.

Yardage figures used in measuring material treated in placer operations are bank measure; that is, the material is measured in the ground before treatment.

The value of metal production herein reported has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$.09050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Oregon, 1946–50, and total, 1852–1950, in terms of recoverable metal [1]

Year	Lode mines [2]		Placer mines [2]		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	23	3,246	37	5,519,000	17,598	$615,930	6,927	$5,597
1947	20	3,277	49	5,150,000	18,979	664,265	30,379	27,493
1948	23	3,119	38	4,012,750	14,611	511,385	13,596	12,305
1949	28	6,215	29	4,157,300	16,226	567,910	12,195	11,037
1950	32	4,257	42	3,247,200	11,058	387,030	13,565	12,277
1852–1950	--------	(3)	--------	(3)	5,752,426	129,297,953	5,295,047	4,857,547

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	7	$2,268	2	$436	----------	----------	$624,231
1947	14	5,880	12	3,456	1	$242	701,336
1948	2	868	7	2,506	----------	----------	527,064
1949	20	7,880	12	3,792	6	1,488	592,107
1950	19	7,904	17	4,590	21	5,964	417,765
1852-1950	12,398	4,663,095	796	91,125	169	21,770	138,931,490

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, or copper precipitates shipped directly to smelters during the calendar year indicated.
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Figure not available.

Gold.—Oregon gold production in 1950, including the fine-gold content of a relatively small amount of "natural gold" sold on the open market, decreased 32 percent compared with 1949. Gold output from placer mines—38 percent below 1949, due largely to the paucity of dredging properties that could be worked profitably—was 82 percent of the State output; of the placer total, bucket-line dredges recovered 87 percent, dragline dredges 5 percent, hydraulicking 5 percent, and nonfloating washing plants (with mechanical excavators), drift mining, and small-scale hand methods together 3 percent. The aggregate of small gains at several mines resulted in a 16-percent increase in lode gold over 1949, but 77 percent of the 1950 output was the yield from three mines. Ninety-five percent of the lode gold produced was from gold ore and old tailings, 4 percent from zinc ore, and 1 percent from gold-silver ore.

The following five producers, listed in order of output, supplied 85 percent of the State total: Powder River Dredging Co. (successor to Baker Dredging Co.) and Porter & Co. (bucket-line dredges); Champion Lease (Champion mine), R. G. Amidon & Co. (Buffalo mine), and Curl Bourne Mines (Bourne group) (lode mines).

Monthly output for 1950 shown in table 4 reflects the sporadic production of Oregon gold.

TABLE 3.—Gold produced at placer mines in Oregon, 1946–50, by class of mine and by method of recovery

Class and method	Mines producing [1]	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucket-line dredges:					
1946	4	5,116,000	13,793	$482,755	$0.094
1947	2	[2] 3,976,500	[2] 12,164	[2] 425,740	[2] .107
1948	2	[2] 3,525,300	[2] 9,842	[2] 344,470	[2] .098
1949	3	3,468,900	10,744	376,040	.108
1950	2	3,051,000	7,827	273,945	.090
Dragline dredges: [3]					
1946	9	252,000	1,910	66,850	.265
1947	12	1,093,000	4,984	174,440	.160
1948	6	393,900	2,048	71,680	.182
1949	3	594,750	3,224	112,840	.190
1950	3	101,000	446	15,610	.155
Suction dredges: [4]					
1946	2	15,000	155	5,425	.362
1947–50	------	------	------	------	------
Nonfloating washing plants: [5]					
1946	1	4,200	45	1,575	.375
1947	5	(2)	(2)	(2)	(2)
1948	3	(2)	(2)	(2)	(2)
1949	4	12,700	54	1,890	.149
1950	5	8,300	40	1,400	.169
Gravel hydraulically handled:					
1946	8	114,000	406	14,210	.125
1947	19	72,200	325	11,375	.158
1948	21	84,300	412	14,420	.171
1949	13	59,100	255	8,925	.151
1950	21	83,300	472	16,520	.198
Small-scale hand methods: [6]					
1946	10	16,800	174	6,090	.363
1947	11	8,300	175	6,125	.738
1948	5	8,900	210	7,350	.826
1949	5	21,600	181	6,335	.293
1950	10	3,200	229	8,015	2.505
Underground placers (drift):					
1946	3	1,000	19	665	.665
1947	------	------	------	------	------
1948	1	350	10	350	1.000
1949	1	250	7	245	.980
1950	1	400	8	280	.700
Grand total placers:					
1946	37	5,519,000	16,502	577,570	.105
1947	49	5,150,000	17,648	617,680	.120
1948	38	4,012,750	12,522	438,270	.109
1949	29	4,157,300	14,465	506,275	.122
1950	42	3,247,200	9,022	315,770	.097

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] Data for nonfloating washing plants included with bucket-line dredges to avoid disclosure of individual output.
[3] Includes all placer operations using dragline excavator for delivering gravel to floating washing plant.
[4] Includes all placer operations using suction pump for delivering gravel to floating washing plant, except those producing less than 100 ounces of gold, which are included with "small-scale hand methods."
[5] Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."
[6] Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Oregon.

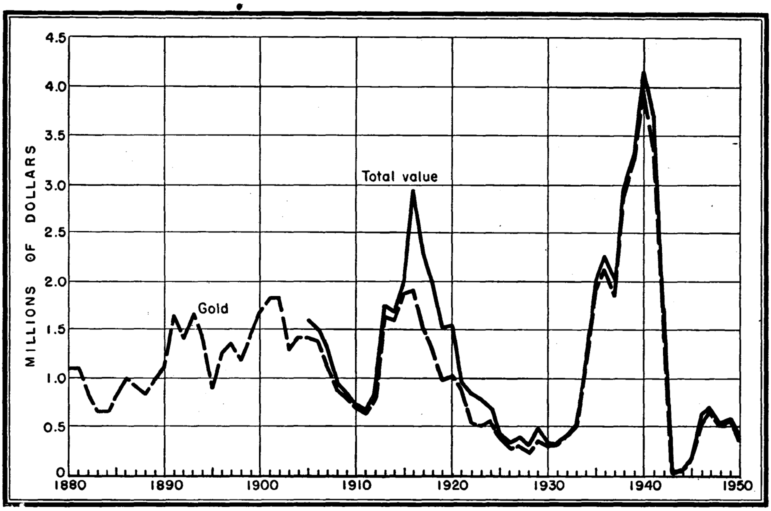

FIGURE 1.—Value of mine production in Oregon of gold, 1880–1950, and total value of gold, silver, copper, lead, and zinc, 1905–50.

Silver.—Oregon silver production in 1950 increased 11 percent over the relatively low output of 1949. Of the total, 74 percent was the yield of the following three leading silver producers, all lode mines, listed in order of output: The Buffalo mine, Champion mine, and Oregon King mine. Nearly 67 percent was recovered from gold ore and old tailings, 14 percent each from gold-silver ore and placer gravels, and more than 5 percent from zinc ore.

Copper, Lead, and Zinc.—Mining and milling of gold and zinc ores in the Bohemia district, Lane County, from July through December supplied most of the State copper, lead, and zinc production reported in 1950. The Champion mine (Champion Lease) was the principal producer of Oregon copper and contributed some of the State lead and zinc in 1950. The Musick mine (Tar Baby Mining Co.) was the leading producer of lead and zinc and followed the Champion mine in copper output. Other mines that produced recoverable base metals included: The Helena mine (Helena Mines, Inc.), Lane County, and the Buffalo mine, Grant County (copper, lead, and zinc); the Oregon King mine, Jefferson County (copper and lead); and the Bourne group, Baker County (copper).

TABLE 4.—Mine production of gold and silver in Oregon in 1950, by months, in fine ounces of recoverable metal

Month	Gold	Silver	Month	Gold	Silver
January	538	161	September	604	1,160
February	421	81	October	789	1,028
March	947	206	November	1,452	3,601
April	1,300	280	December	1,177	2,555
May	1,128	275			
June	1,210	324	Total: 1950	11,058	13,565
July	901	2,732	1949	16,226	12,195
August	591	1,162			

MINE PRODUCTION BY COUNTIES

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by counties, in terms of recoverable metal

County	Mines producing[1]		Gold					
	Lode	Placer	Lode		Placer		Total	
			Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Baker	10	9	397	$13,895	5,981	$209,335	6,378	$223,230
Curry	1	(2)	3	105	15	525	18	630
Douglas	—	1	—	—	8	280	8	280
Grant	6	6	631	22,085	2,227	77,945	2,858	100,030
Jackson	4	9	21	735	221	7,735	242	8,470
Jefferson	1	—	23	805	—	—	23	805
Josephine	5	14	120	4,200	556	19,460	676	23,660
Lane	3	—	810	28,350	—	—	810	28,350
Malheur	—	1	—	—	8	280	8	280
Wheeler	2	2	31	1,085	6	210	37	1,295
Total: 1950	32	42	2,036	71,260	9,022	315,770	11,058	387,030
1949	28	29	1,761	61,635	14,465	506,275	16,226	567,910

County	Silver (lode and placer)		Copper		Lead		Zinc		Total value
	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value	
Baker	1,785	$1,616	1,100	$228	—	—	—	—	$225,074
Curry	7	6	—	—	—	—	—	—	636
Douglas	3	3	—	—	—	—	—	—	283
Grant	4,957	4,486	700	146	4,300	$581	1,000	$142	105,385
Jackson	39	35	—	—	—	—	—	—	8,505
Jefferson	1,886	1,707	700	146	1,200	162	—	—	2,820
Josephine	191	173	—	—	—	—	—	—	23,833
Lane	4,688	4,243	35,500	7,384	28,500	3,847	41,000	5,822	49,646
Malheur	2	2	—	—	—	—	—	—	282
Wheeler	7	6	—	—	—	—	—	—	1,301
Total: 1950	[3]13,565	12,277	38,000	7,904	34,000	4,590	42,000	5,964	417,765
1949	[3]12,195	11,037	40,000	7,880	24,000	3,792	12,000	1,488	592,107

[1] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[2] From property not classed as a mine.
[3] Sources of total silver as follows—1950: 11,706 ounces from lode mines and 1,859 ounces from placers; 1949: 9,488 ounces from lode mines and 2,707 ounces from placers.

MINING INDUSTRY

Indicating a trend toward more selective mining, Oregon lode mines that reported production in 1950 increased 14 percent compared with 1949; and the tonnage of ore and tailings treated at mines or sold decreased 32 percent, whereas the value of gold, silver, copper, lead, and zinc produced at lode mines during 1950 increased 20 percent. Placer mines that reported production in 1950 increased 45 percent over 1949; however, the total yardage of gravel treated decreased 22 percent in 1950, owing largely to cessation of operation during a large part of the year by two dredges, both major producers of gold in 1949. The average value per cubic yard of gravel treated in Oregon in 1950 dropped 20 percent compared with 1949.

The two properties worked by bucket-line dredge had one dredge each; one operated throughout the year. Three dragline dredges washed gravel during periods of 1950, but only one operated at the close of the year.

Small mines predominated in 1950, due in part to the properties worked for short duration to complete assessment work. However, six lode mines produced 77 percent of the State ore and 97 percent of the gravel washed in 1950 was from four placer mines.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	3,593	1,929	8,957	32,000	12,100	11,000
Dry gold-silver ore	200	23	1,886	700	1,200	
Zinc ore	260	72	785	5,300	20,600	31,000
Old tailings (gold)	204	12	78		100	
Total lode mines	4,257	2,036	11.706	38,000	34,000	42,000
Gravel (placer operations)		9,022	1,859			
Total: 1950	4,257	11,058	13,565	38,000	34,000	42,000
1949	6,215	16,226	12,195	40,000	24,000	12,000

METALLURGICAL INDUSTRY

Of the 32 Oregon lode mines in 1950, 19 treated ore by amalgamation, 6 operated concentration mills and shipped the product to smelters, 4 shipped ore and old tailings for direct smelting, 2 consigned ore for concentration and smelting on a custom basis, and 1 cyanided old tailings; 86 percent of the State total ore and old tailings was treated in mills, and 14 percent was shipped crude to smelters. The 125-ton Champion mill operated by Kenneth O. Watkins near Disston, Oreg., treated custom ores from mines in the Bohemia district, Lane County, by selective flotation. All material requiring smelting was shipped out of the State.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	9,022	1,859			
Amalgamation	181	34			
Cyanidation	5	1			
Smelting of ore	521	1,403	1,100	800	200
Smelting of concentrate	1,329	10,268	36,900	33,200	41,800
Total: 1950	11,058	13,565	38,000	34,000	42,000
1949	16,226	12,195	40,000	24,000	12,000

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore and old tailings treated at mills

	Material treated		Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
	Ore (short tons)	Old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES										
Baker	350	200	90	19	2	12	22			
Curry	1		3	1						
Grant	639		5	1	92	480	3,670	700	3,500	800
Jackson	28		21	4						
Jefferson	200				39	23	1,886	700	1,200	
Josephine	40		36	4	2	4	2			
Lane	2,208				[1] 268	810	4,688	35,500	28,500	41,000
Wheeler	7		31	6						
Total: 1950	3,473	200	186	35	[1] 403	1,329	10,268	36,900	33,200	41,800
1949	4,956	472	275	97	310	822	6,010	20,200	18,000	12,000
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS										
Dry gold					96	496	3,694	700	3,500	800
Dry gold-silver					39	23	1,886	700	1,200	
Copper					85	363	1,778	13,000	3,200	
Lead					9	132	134	400	2,000	
Zinc-copper					102	243	1,991	16,800	2,700	10,000
Zinc-lead-copper					[1] 72	72	785	5,300	20,600	31,000
Total 1950					[1] 403	1,329	10,268	36,900	33,200	41,800

B. For ore and old tailings shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Baker	479	295	554	1,100		
Grant	48	146	720		800	200
Josephine	57	80	129			
Total: 1950	584	521	1,403	1,100	800	200
1949	787	664	3,381	19,800	6,000	
BY CLASS OF MATERIAL						
Dry gold ore	580	514	1,326	1,100	700	200
Old tailings (gold)	4	7	77		100	
Total 1950	584	521	1,403	1,100	800	200

[1] Includes 40 tons of concentrate from ore milled in 1949.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	96	496	3, 694	861	5, 476	4, 138
Dry gold-silver	39	23	1, 886	712	2, 034	2, 425
Copper	85	363	1, 778	13, 455	5, 919	4, 239
Lead	9	132	134	644	2, 111	1, 037
Zinc-copper	102	243	1, 991	19, 824	2, 831	13, 833
Zinc-lead-copper	[1] 72	72	785	6, 492	21, 034	43, 043
Total: 1950	[1] 403	1, 329	10, 268	41, 988	39, 405	68, 715
1949	310	822	6, 010	21, 329	22, 258	22, 550
ORE AND OLD TAILINGS SHIPPED DIRECTLY TO SMELTERS						
Dry gold ore	580	514	1, 326	1, 573	991	540
Old tailings (gold)	4	7	77	18	136	86
Total: 1950	584	521	1, 403	1, 591	1, 127	626
1949	787	664	3, 381	20, 598	9, 475	3, 413

[1] Includes 40 tons of concentrate from ore milled in 1949.

REVIEW BY COUNTIES AND DISTRICTS

BAKER COUNTY

Cracker Creek District.—Curl Bourne Mines worked the Bourne group located 7 miles north of Sumpter from May through December 1950 and shipped ore containing substantial quantities of gold and silver and some copper to a smelter.

Sumpter District.—Baker Dredging Co. and successor Powder River Dredging Co. operated a Yuba electric bucket-line dredge with 70 9-cubic-foot buckets at Sumpter Valley Placers throughout 1950. Powder River Dredging Co. washed 1,158,092 cubic yards of gravel, which averaged 7 cents in gold and silver values a cubic yard, from July 20 to December 31, 1950.

GRANT COUNTY

Granite District.—Porter & Co. operated a Yuba electric bucket-line dredge with 60 4½-cubic-foot buckets on Olive Creek from March 31 to July 6, 1950. The equipment subsequently was moved to Crane Creek and worked from November 15 to December 31, 1950. R. G. Amidon & Co., an Oregon corporation, worked the Buffalo mine from July 16 to December 31, 1950; 530 tons of ore treated in the company 30-ton flotation plant yielded 82 tons of concentrate containing in gross metal 460 ounces of gold, 3,578 ounces of silver, 837 pounds of copper, 5,326 pounds of lead, and 4,119 pounds of zinc. The concentrate and 30 tons of crude ore containing in gross metal 105 ounces of gold, 510 ounces of silver, 187 pounds of copper, 765 pounds of lead, and 540 pounds of zinc were shipped to smelters. The mine was worked sporadically in 1950 prior to July 16.

North Fork District.—Calhoun & Howell, Oregon, Ltd., operated a Diesel dragline dredge with a 3-cubic-yard bucket on the North Fork of John Day River from March 4 to April 3, 1950; 60,000 cubic yards of gravel treated averaged 10 cents a cubic yard in gold and silver values.

JACKSON COUNTY

Gold Hill District.—R. E. Cook & Ed Koster hydraulicked the Lance mine on Foots Creek from February 1 to May 1, 1950; 3,000 cubic yards of gold-bearing gravel washed yielded 12 ounces of gold and 2 ounces of silver.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Oregon in 1950, by counties and districts,[1] in terms of recoverable metal

County and district [1]	Mines producing [2]		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (lode and placer,[3] fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Baker County:											
Baker	(4)	2	(4)	(4)	16	16	[5] 6				[5] $565
Connor Creek		1			5	5					175
Eagle Creek	1		10	4		4	3				143
Greenhorn [6]	1	1	27	16	55	71	12				2,496
Lower Burnt River		(7)			1	1					35
Sparta	1		40	19		19	6				670
Upper Burnt River	2	4	280	29	89	118	17				4,146
Virtue	1		199	50		50	8	200			1,798
Curry County:											
Agness		(7)			15	15	6				530
Chetco	1		1	3		3	1				106
Douglas County:											
Riddle		1			6	6	3				213
Umpqua (Wolf Creek)		(7)			2	2					70
Grant County:											
Canyon		1			8	8	1				281
Granite	3	(4)	674	619	(4)	619	[8] 4,313	700	4,200	1,000	[8] 26,423
Greenhorn [6]	1	2	8	4	10	14	3				493
North Fork		1			170	170	39				5,985
Quartzburg	1		1	1		1					35
Susanville	1	1	4	7	9	16	78		100		645
Jackson County:											
Gold Hill	1	2	9	1	32	33	5				1,159
Jacksonville		2			48	48	8				1,687
Upper Applegate	3	5	19	20	141	161	26				5,659
Jefferson County: Ashwood	1		200	23		23	1,886	700	1,200		2,820
Josephine County:											
Galice	1	3	13	31	263	294	29				10,316
Grants Pass		2			38	38	6				1,335
Greenback	2	5	23	5	224	229	25				8,038
Illinois River		2			10	10					350
Lower Applegate	1	(7)	61	82	1	83	129				3,022
Waldo	1	2	(9)	2	20	22	2				772
Lane County: Bohemia	3		2,208	810		810	4,688	35,500	28,500	41,000	49,646
Malheur County:											
Malheur		(7)			2	2	1				71
Mormon Basin		1			6	6	1				211
Wheeler County: Spanish Gulch	2	2	7	31	6	37	7				1,301
Other districts [10]	4	2	473	279	7,845	8,124	2,256	900			286,569
Total Oregon	32	42	4,257	2,036	9,022	11,058	13,565	38,000	34,000	42,000	417,765

[1] Only those districts shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts listed in footnote 10 and their output included with "Other districts."
[2] Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.
[3] Source of silver: 11,706 ounces from lode mines and 1,859 ounces from placers.
[4] Included with "Other districts."
[5] Exclusive of lode output, which is included with "Other districts."
[6] Greenhorn district is in Baker and Grant counties.
[7] From property not classed as a mine.
[8] Exclusive of placer output, which is included with "Other districts."
[9] Mill cleanup.
[10] Includes Baker (lode), Cracker Creek (lode), and Sumpter districts (placer) in Baker County, and Granite district (placer) in Grant County.

Jacksonville District.—Christean Bros. operated a gasoline dragline dredge with a 1-cubic-yard bucket on Miller Creek from February 16 to April 25, 1950, and recovered 46 ounces of gold and 7 ounces of silver from 9,000 cubic yards of gravel.

JEFFERSON COUNTY

Ashwood District.—Oregon King Mines, Henry Anderegg, lessee, operated the Oregon King mine for 1 month in 1950. Approximately 200 tons of ore treated by flotation yielded 39 tons of concentrate containing in gross metal 23 ounces of gold, 1, 886 ounces of silver, 712 pounds of copper, 2,034 pounds of lead, and 2,425 pounds of zinc, which was shipped to a smelter. A fire on August 2, 1950, damaged the mine shaft and some surface installations.

JOSEPHINE COUNTY

Galice District.—Naron & Van Devanter, Oregon, Ltd., operated a Diesel dragline dredge with a 1½-cubic-yard bucket and Bodinson floating washing plant at Lewis Bar from July 16 to December 31, 1950; the gravel washed averaged 24 cents a cubic yard in gold and silver values.

Greenback District.—Several hydraulic mines worked during 1950 included: The M. H. Davis group (Harry Steward), Goff (Cleo C. Clark), McIntosh (Harold McIntosh), and Schleigh (W. C. Schleigh); 2,000 cubic yards of gravel washed at the Schleigh mine yielded 14 ounces of gold and 3 ounces of silver.

Lower Applegate District.—Wm. S. Robertson & Associates worked the Humdinger mine on Horsehead Creek from January 1 through August 27, 1950; 56 tons of ore shipped to a smelter contained 79 ounces of gold, 129 ounces of silver, and 90 pounds of copper.

LANE COUNTY

Bohemia District.—The Champion Lease (Kenneth O. Watkins, partner) operated the Champion flotation mill from July 1 through December 31, 1950; 1,948 tons of ore from the Champion mine yielded 85 tons of flotation copper concentrate containing in gross metal 363 ounces of gold, 1,778 ounces of silver, 13,455 pounds of copper, 5,919 pounds of lead, and 4,239 pounds of zinc; 102 tons of flotation zinc-copper concentrate containing in gross metal 243 ounces of gold, 1,991 ounces of silver, 19,824 pounds of copper, 2,831 pounds of lead, and 13,833 pounds of zinc; and 9 tons of gravity lead concentrate containing in gross metal 132 ounces of gold, 134 ounces of silver, 644 pounds of copper, 2,111 pounds of lead, and 1,037 pounds of zinc. Ores from the Musick mine, Tar Baby Mining Co. (115 tons, yielding 22 tons of flotation zinc-lead-copper concentrate containing in gross metal 32 ounces of gold, 256 ounces of silver, 2,380 pounds of copper, 6,595 pounds of lead, and 11,920 pounds of zinc and an undetermined tonnage of zinc concentrate), and the Helena mine, Helena Mines, Inc. (145 tons, yielding 10 tons of zinc-lead-copper flotation concentrate containing in gross metal 34 ounces of gold, 194 ounces of silver, 1,380 pounds of copper, 4,303 pounds of lead, and 15,340 pounds of zinc and an undetermined tonnage of zinc concentrate), also were milled. Concentrates (zinc concentrate excepted) were shipped to smelters.

232294—53——100

South Dakota

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Samuel A. Gustavson

GENERAL SUMMARY

GOLD was produced by only two companies in South Dakota in 1950, compared with five in 1949. However, production was greater by 22 percent. The output of silver (all a byproduct of gold mining) increased about 30 percent. No production of copper, lead, or zinc was reported in 1950. The two operating companies were the Homestake Mining Co. at Lead and the Bald Mountain Mining Co. at Trojan, both in Lawrence County.

In the years following the recent war, labor shortages and increasing labor and material costs against set prices for gold and silver have been unfavorable for gold mining in the United States; consequently, many operators in the State have been unable to continue economical mining or have not resumed mining since War Production Board Limitation Order L 208 was rescinded July 1, 1945.

The Homestake Mining Co. reported having a fair supply of labor during the first half of 1950 and during November and December. An annual average of 45 more men were employed in the mine department than in 1949. With the beginning of the war in Korea, fear of the imminence of a third world war with another gold-mine closing order caused men to begin leaving the mines, with the result that average employment in the mine department was 272 less in October than in June. In November and December the migration of labor reversed as the international situation eased, and a substantial number of men returned.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production herein reported has been calculated at the prices shown in table 1.

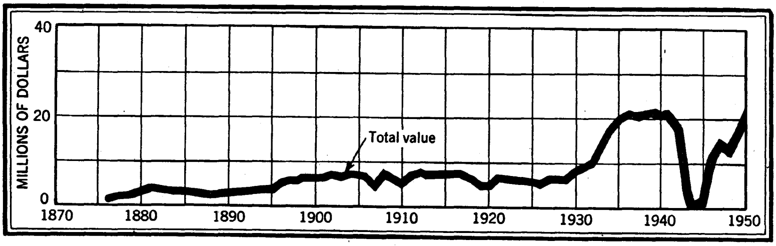

FIGURE 1.—Total value of mine production of gold and silver in South Dakota, 1876–1950

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35	$0.808	$0.162	$0.109	$0.122
1947	35	.905	.210	.144	.121
1948	35	.905+	.217	.179	.133
1949	35	.905+	.197	.158	.124
1950	35	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver: Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in South Dakota, 1946–50, and total, 1876–1950, in terms of recoverable metal [1]

Year	Mines producing		Ore (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1946	5		872,242	312,247	$10,928,645	86,901	$70,216
1947	4		939,384	407,194	14,251,790	111,684	101,074
1948	6		1,005,339	377,850	13,224,750	94,693	85,702
1949	5	1	1,230,172	464,650	16,262,750	109,383	98,997
1950	2		1,391,162	567,996	19,879,860	142,065	128,576
1876–1950			(2)	22,863,991	581,836,894	10,145,834	7,314,407

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946							$10,998,861
1947			8	$2,304	19	$4,598	14,359,766
1948			16	5,728	29	7,714	13,323,894
1949			4	1,264			16,363,011
1950							20,008,436
1876–1950	106	$36,466	483	67,796	265	56,406	589,311,969

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes retreated; and ore or old tailings shipped directly to smelters during the calendar year indicated. For production of gold and silver in South Dakota in earlier years, see Mineral Resources, 1913, pt. 1, p. 42; Mineral Resources, 1922, pt. 1, p. 194; and subsequent volumes of Mineral Resources and Minerals Yearbook.
[2] Figure not available.

TABLE 3.—Mine production of gold and silver in South Dakota in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Month	Gold (fine ounces)	Silver (fine ounces)
January	47,491	12,930	September	49,144	12,045
February	43,830	11,835	October	51,239	12,585
March	46,725	11,390	November	43,481	11,065
April	48,040	11,675	December	42,079	11,235
May	48,194	11,650			
June	48,913	11,655	Total: 1950	567,996	142,065
July	48,556	11,690	1949	464,650	109,383
August	50,304	12,310			

MINE PRODUCTION BY COUNTIES

During both 1949 and 1950 all gold and silver produced was from mines in Lawrence County. In 1949 a small quantity of lead was produced in Lawrence County. There has been no reported production of zinc in South Dakota since 1948 and no production of copper since 1944. Virtually all of the gold, silver, copper, lead, and zinc produced in South Dakota has come from mines in the mountain group known as the Black Hills, which is situated chiefly in Custer, Lawrence, and Pennington Counties. Most of the gold, silver, lead, and zinc has been produced from mines in Lawrence County and most of the copper from mines in Pennington County. No production of gold or silver has been recorded from mines in Custer County since 1941.

MINING AND METALLURGICAL INDUSTRY

Details of mining and milling in South Dakota are given in the following Review by Counties. The tables that follow show the quantity of material treated and the gold and silver recovered by amalgamation and cyanidation. The Homestake Mining Co. treats its ore by both amalgamation and cyanidation, accounting for a duplication of tonnage in the two tables.

TABLE 4.—Gold and silver bullion produced at mills in South Dakota by amalgamation, 1946–50

Year	Ore treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
1946	793, 034	197, 425	35, 498
1947	849, 123	262, 257	52, 057
1948	896, 932	250, 782	72, 100
1949	1, 112, 193	312, 676	83, 538
1950	1, 265, 118	389, 473	111, 080

TABLE 5.—Gold and silver bullion produced at mills in South Dakota by cyanidation, 1946–50

Year	Material treated (short tons)			Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
	Crude ore	Sands and slimes	Total		
1946	79, 208	783, 103	862, 311	114, 822	51, 403
1947	86, 511	848, 875	935, 386	144, 888	59, 092
1948	106, 927	896, 567	1, 003, 494	126, 998	21, 669
1949	117, 979	1, 112, 183	1, 230, 162	151, 950	25, 632
1950	126, 044	1, 265, 118	1, 391, 162	178, 523	30, 985

REVIEW BY COUNTIES

LAWRENCE COUNTY

Homestake Mine.—The Homestake Mining Co. operated its mine in the Whitewood district through three shafts (the deepest being 4,245 feet) and an inside winze to the 5,000-foot level. Development in the mine during the year included 24,649.5 feet of drifts, 13,597.5 feet of raises and 37,764 feet of diamond drilling. The mill treated an average of 3,466 tons per day on a 24-hour, 7-day schedule during 1950 compared with 3,047 tons daily in 1949. Gold and silver recovered are refined by the company at Lead, and virtually pure metals are shipped to the Denver Mint. The following data are extracted from the annual report of the general manager of the Homestake Mining Co. for the year ended December 31, 1950:

Ore mined in 1950 was 1,265,118 tons, which compares with 1,112,183 tons in 1949. Bullion with value of $19,264,048.20 was produced. This is $3,580,889.15 more than in 1949. Average realization was $15.23 per ton and metallurgical recovery was 97.03 percent, which again is a new record. This compares with $14.10 per ton and 96.98 percent in 1949.

Increased production of ore resulted primarily from the greater number of men available for underground work. For the first time since the resumption of operations, the accumulation of broken ore in shrinkage stopes was sufficient for steady production. The average number of men employed in the mine department during 1950 was 45 more than in 1949. When the international situation became serious, men began leaving with the result that the average number of men in the mine department in October was 272 less than in June. There was, however, a substantial increase during the last two months of the year and on December 31, 1950 there were only 56 less than on December 31, 1949.

For the first time since the end of World War II, there was in 1950 a slight decrease in the operating expense per ton of ore. Such expense, exclusive of taxes and contributions to the Pension Trust, was 3.22 percent lower in 1950 than in 1949. Even with inclusion of the Pension Trust cost, the 1950 cost was 2.58 percent lower than in 1949 although it was nearly 68 percent higher than in 1941.

Broken ore in shrinkage stopes decreased from 461,000 tons on December 31, 1949 to 430,000 tons at the end of 1950. The reserve of developed ore, including broken ore, is 20,804,000 tons as compared with 21,024,000 at the end of 1949.

The mine and plant were well maintained and are in excellent condition. Construction work was begun at the Yates crusher plant to add a third stage of crushing. Similar remodelling will be done at the Ross crusher plant. When completed, stamps will be eliminated in the South Mill with resultant economies in operation.

Sale of electrical energy in reduced amount to the Black Hills Power and Light Company continued during the first half of the year. A total of 4,415,200 kwh was delivered to its system. Such sale was discontinued on June 30, 1950 because further extension of the arrangement was not granted by the Federal Power Commission.

Natural gas again became available during the last part of the year. Where economies could be effected, plants converted to coal late in 1949 were reconverted for the use of gas.

Remodelling and modernization of the Homestake Recreation Building in Lead were completed except for some minor details.

The operation and output of our sawmill at Spearfish were normal.

The Wyodak mine produced 349,560 tons of coal in 1950, as compared with 314,197 tons in 1949. Receipts from the sale of electrical energy increased from $61,479.40 in 1949 to $83,845.24 in 1950.

Ore milled, receipts, and dividends, Homestake mine, 1946–50 [1]

Year	Ore milled (short tons)	Receipts for bullion product		Dividends
		Total	Per ton	
1946	792,994	$10,458,896.22	$13.1891	$2,812,992
1947	849,023	13,796,720.25	16.2501	4,018,560
1948	896,862	12,658,138.55	14.1138	4,018,560
1949	1,112,183	15,683,159.05	14.1012	4,520,880
1950	1,265,118	19,264,048.20	15.2271	5,525,520

[1] From 1876 to 1950, inclusive, this mine yielded bullion and concentrates that brought a net return of $513,377,199 and paid $170,702,314 in dividends.

Other Mines.—The Bald Mountain Mining Co.—the only other producer of gold and silver in the State in 1950—operated its property, which includes the Empire, Portland, Dakota, Clinton, Two Johns, Ajax-Alaska, Trojan, Foley, American Express, and "Mogul Mines Co." claims. The company milled 126,044 tons of ore in its cyanidation mill for a daily average of 345 tons in 1950. The mill is operated three shifts 7 days a week and has a rated capacity of 370 tons. Development in the mine during 1950 included 5,349 feet of crosscut and 100 feet of diamond drilling.

Texas

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By F. F. Netzeband and Alice Feltch

GENERAL SUMMARY

MINE production of gold, silver, copper, and lead from Texas during 1950 was valued at $39,598 compared with $55,003 for 1949. The R. I. Carr operations in Presidio County was the sole producer in 1950. In 1949 there had been four producers, located in Culberson, Hudspeth, and Presidio counties. Lead accounted for 88 percent of the total value, silver 6 percent, gold 4 percent, and copper 2 percent.

No zinc was reported from Texas crude ore in 1950. Considerable zinc was produced from hot slags of the lead smelter, but these are credited to the various mines on the basis of the assay report of the ore and are thus apportioned to the States from which they were produced.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946 to Dec 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

MINE PRODUCTION

Since 1947, lead has been the principal metal produced in Texas, and in 1950 its value was nearly 16 times greater than that of silver—the principal metal produced in the State from 1885 to 1946. With the closing of the Presidio mine in Presidio County in 1942 and the

Hazel mine in Culberson County in 1941, output of silver has decreased markedly. Table 2 shows the annual output of ore and the quantity and value of the metals recovered from Texas mine production from 1946 to 1950 as well as total metal production from 1885 to 1950.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Texas, 1946–50, and total, 1885–1950, in terms of recoverable metal [1]

Year	Ore (short tons)	Gold		Silver	
		Fine ounces	Value	Fine ounces	Value
1946	6,705	9	$315	42,922	$34,681
1947	4,552	45	1,575	20,547	18,595
1948	1,850	57	1,995	3,065	2,774
1949	2,140	40	1,400	2,691	2,435
1950 [2]	935	49	1,715	2,454	2,221
1885–1950	(3)	8,481	230,780	33,297,120	23,441,086

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	3	$972	47	$10,246	44	$10,736	$56,950
1947	6	2,520	78	22,464	22	5,324	50,478
1948 [4]	23	9,982	170	60,860			75,611
1949 [4]	24	9,456	132	41,712			55,003
1950 [2] [4]	2	832	129	34,830			39,598
1885–1950	1,364	392,833	5,344	659,561	810	122,551	24,846,811

[1] Includes recoverable metal content of ore shipped during the calendar year indicated.
[2] All of 1950 production was from one mine in Presidio County, which produced lead ore.
[3] Data not available.
[4] Does not include zinc and lead recovered by the slag-fuming plant at the El Paso smelter from old accumulated slag resulting from operations in previous years.

TABLE 3.—Mine production of gold, silver, copper, and lead in Texas in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)
January	3	139		6
February	9	551	1	21
March	8	446		16
April	3	124		8
May	4	324		17
June	8	230		20
July	2	144		7
August	4	160		10
September	2	135		6
October	2	89		5
November	1	65		5
December	3	47	1	8
Total: 1950	49	2,454	2	129
1949	40	2,691	24	132

METALLURGICAL INDUSTRY

The smelting and refining industry was an important segment of Texas industrial activity during 1950 and continued to surpass the State mine production in value. Smelters operating in Texas during 1950 included two zinc-retort, one copper, one lead, one antimony, and one tin; there were also one electrolytic zinc refinery and one electrolytic copper refinery.

The American Smelting & Refining Co. continued to operate lead and copper smelters at El Paso, treating ores purchased from mine operators in Arizona, Colorado, Missouri, New Mexico, Texas, and Utah, as well as ores from Mexico, Tasmania, Central America, Canada, South-West Africa, and Arabia. The company electrolytic zinc refinery at Corpus Christi treated concentrates from New Mexico, Colorado, Arizona, and Mexico. The company gas-fired retort zinc smelter at Amarillo handled ores and concentrates from Arizona, California, Colorado, New Mexico, Utah, and Texas.

The Machovec smelter of the American Zinc Co. of Illinois at Dumas operated throughout 1950 on concentrates from Arizona and New Mexico and zinc fume from slag-fuming plants in Utah and Idaho, as well as some concentrates of foreign origin.

The Nichols electrolytic copper refinery at El Paso continued to refine copper anodes from the Phelps Dodge Corp. smelters in Arizona. This plant also produced copper sulfate.

REVIEW BY COUNTIES

Presidio County.—R. I. Carr continued to produce lead ore from his properties in the famous Shafter district. This ore was shipped to the American Smelting & Refining Co. smelter at El Paso. Silver, gold, and copper were also recovered from these ores during 1950.

No other mine production was reported from Texas in 1950.

Utah

Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Paul Luff

GENERAL SUMMARY

MUCH more intensive copper mining in Utah in 1950 than in 1949 resulted in a record output of gold in the State, the largest output of copper since 1944, and a gain in output of silver; the production of lead and zinc, however, decreased materially. Compared with 1949, the output of gold increased 143,493 ounces (46 percent), silver 358,928 ounces (5 percent), and copper 81,385 short tons (41 percent); lead production declined 8,319 tons (16 percent) and zinc 8,992 tons (22 percent). Output of copper ore increased 10,125,367 tons (48 percent), but that of zinc-lead ore declined 262,495 tons (31 percent).

Utah remained the second-largest copper-producing State (Arizona was the largest) and ranked second in gold and silver, third in lead, and ninth in zinc.

The value of the five metals in 1950 (exceeded only by that for Arizona) was $159,415,431, the highest in the State's history and 31 percent greater than the value of $121,649,828 in 1949. Of the total value in 1950, copper contributed 73 percent, gold 10 percent, lead more than 7 percent, zinc less than 6 percent, and silver 4 percent. The value of the metals recovered from copper ore was $132,624,200 in 1950 (83 percent of the State total from all ores), and that recovered from zinc-lead ore was $23,854,200 (15 percent of the State total).

In 1950, 93 percent of Utah's gold production, 68 percent of its silver, more than 99 percent of its copper, 56 percent of its lead, and 51 percent of its zinc were recovered from copper ore and zinc-lead ore mined in the West Mountain (Bingham) district, Salt Lake County. The remainder of the gold, silver, copper, lead, and zinc was recovered largely from zinc-lead ore and siliceous ores mined in the Park City and Tintic districts.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc in Utah, 1946–50, and total, 1864–1950, in terms of recoverable metal [1]

Year	Mines producing: Lode	Mines producing: Placer	Ore (short tons)	Gold (lode and placer): Fine ounces	Gold (lode and placer): Value	Silver (lode and placer): Fine ounces	Silver (lode and placer): Value
1946	88	1	13,245,691	178,533	$6,248,655	4,118,453	$3,327,710
1947	118	2	30,383,114	421,662	14,758,170	7,780,032	7,040,929
1948	118	2	25,741,911	368,422	12,894,770	8,045,329	7,281,429
1949	93	2	21,993,467	314,058	10,992,030	6,724,880	6,086,356
1950	84	2	31,855,601	457,551	16,014,285	7,083,808	6,411,204
1864–1950			[2] 679,576,781	12,204,671	327,388,525	748,806,568	550,905,680

Year	Copper: Short tons	Copper: Value	Lead: Short tons	Lead: Value	Zinc: Short tons	Zinc: Value	Total value
1946	114,284	$37,028,016	30,711	$6,694,998	28,292	$6,903,248	$60,202,627
1947	266,533	111,943,860	49,698	14,313,024	43,673	10,568,866	158,624,849
1948	227,007	98,521,038	55,950	20,030,100	41,490	11,036,340	149,763,677
1949	197,245	77,714,530	53,072	16,770,752	40,670	10,086,160	121,649,828
1950	278,630	115,910,080	44,753	12,083,310	31,678	8,996,552	159,415,431
1864–1950	5,869,856	1,776,479,997	4,622,513	552,454,760	1,140,522	178,659,859	3,385,888,821

[1] Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes retreated, and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.
[2] Figures estimated for certain years before 1901.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	35,191	574,409	22,859	3,943	2,926
February	35,686	568,174	21,409	3,851	2,947
March	41,886	636,789	23,804	4,592	3,356
April	39,271	617,790	22,450	4,618	3,408
May	41,962	659,789	23,609	5,051	3,461
June	38,233	638,114	21,489	5,035	3,346
July	38,971	466,590	23,239	1,561	1,339
August	42,514	563,990	26,850	1,486	1,046
September	37,281	568,790	24,009	2,981	2,161
October	33,161	519,792	20,654	3,056	2,036
November	37,681	614,790	24,304	3,807	2,635
December	35,714	654,791	23,954	4,772	3,017
Total: 1950	457,551	7,083,808	278,630	44,753	31,678
1949	314,058	6,724,880	197,245	53,072	40,670

Gold.—In 1950 Utah's output of recoverable gold increased to 457,551 fine ounces, the highest annual output in the State's history. Most of the gold produced in Utah is a byproduct of copper ore, and in 1950 this class of ore yielded 413,090 ounces of gold—145,199 ounces (54 percent) more than in 1949. The Utah Copper mine at Bingham accounted for all the increase. Zinc-lead ore supplied 37,324 ounces of gold in 1950, an increase of only 882 ounces (2 percent) over 1949. More than 96 percent of the gold recovered from zinc-lead ore came from the Park City region and West Mountain (Bingham) district.

Of the total gold in 1950, 90 percent came from copper ore, 8 from zinc-lead ore, and most of the remainder from silver ore, gold-silver ore, and lead ore. Four ounces of gold were recovered from placers in Grand and Millard Counties. The West Mountain (Bingham) district supplied 94 percent of the State total, the Park City region 5, and the Tintic district about 1 percent. Output of gold in the West Mountain (Bingham) district increased 50 percent from 1949 and in the Park City region 24 percent, but in the Tintic district it declined 36 percent.

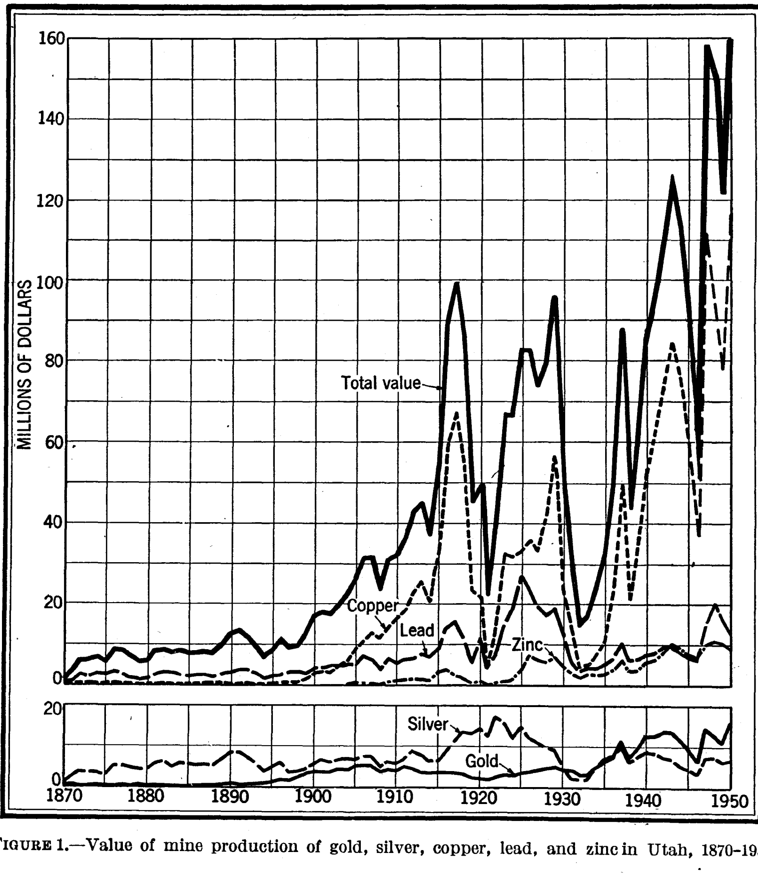

FIGURE 1.—Value of mine production of gold, silver, copper, lead, and zinc in Utah, 1870–1950.

The leading gold producers in Utah in 1950—each with an output exceeding 1,000 ounces of recoverable metal—were as follows: Utah Copper mine in the West Mountain (Bingham) district; the property of the New Park Mining Co. in the Park City region; United States & Lark group in the West Mountain (Bingham) district; Chief Consolidated Mining Co. property in the Tintic district; and Daly No. 1 waste dump and Park Utah Consolidated property in the Park City region. These six properties furnished 99 percent of the State gold.

Silver.—Utah's output of recoverable silver in 1950 was 7,083,808 fine ounces, a 5-percent gain over 1949. Copper ore supplied 3,312,949 ounces—1,079,241 ounces (48 percent) more than in 1949—and zinc-lead ore 2,849,674 ounces—828,059 ounces (23 percent) less than in 1949. More than 99 percent of the silver recovered from copper ore came from the West Mountain (Bingham) district, and 96 percent of the silver recovered from zinc-lead ore came from the Park City region, Tintic district, and West Mountain (Bingham) district. Copper ore furnished 47 percent of the State silver in 1950, zinc-lead ore 40 percent, and silver ore and gold-silver ore 10 percent; the remainder came principally from lead ore. Output of silver increased 15 percent in the West Mountain (Bingham) district and 1 percent in the Tintic district but declined 10 percent in the Park City region.

Utah properties that produced more than 150,000 ounces of recoverable silver each in 1950 were as follows: Utah Copper mine, United States & Lark group, properties of Chief Consolidated Mining Co. and New Park Mining Co., Daly No. 1 waste dump, Butterfield group, and Park Utah Consolidated Mines Co. property. These seven producers contributed 92 percent of the State silver.

Copper.—In 1950 Utah's output of recoverable copper increased to 278,630 short tons, the largest output since 1944. This resulted from continuous operations throughout the year at the Utah Copper open pit in Bingham Canyon, the State's only large producer. Operations were maintained throughout the year on a schedule of 6 days per

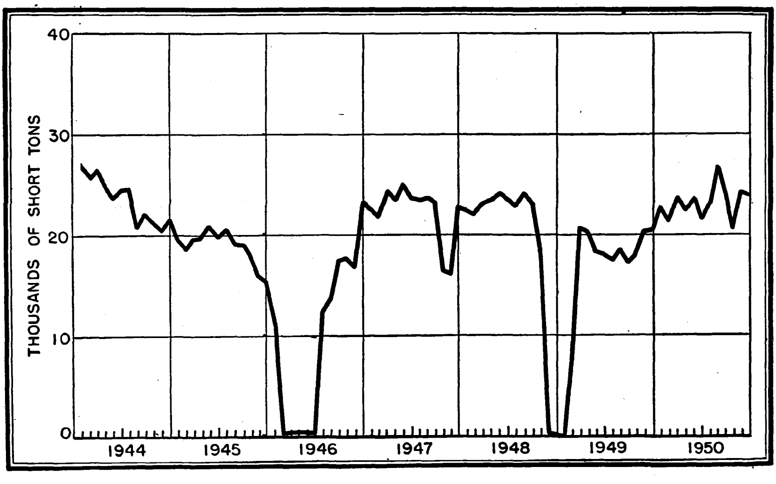

FIGURE 2.—Mine production of copper in Utah, 1944–50, by months, in terms of recoverable metal.

week and three shifts per day. The United States & Lark group, also at Bingham, was the only other Utah property to produce more than a million pounds of recoverable copper in 1950. These two producers contributed more than 99 percent of the State copper.

Lead.—Despite a good demand for lead and favorable metal prices during the last half of 1950, Utah's output of recoverable lead in 1950 (44,753 short tons) was the smallest since 1946 and showed a loss of 16 percent from that in 1949. This loss resulted mainly from the shut-downs, because of a fire and labor difficulties, at the United States & Lark property at Bingham, the largest producer of zinc-lead ore in the State. In 1950 zinc-lead ore from the West Mountain (Bingham) district supplied 25,240 tons of lead (56 percent of the State total), the Park City region 7,536 tons (17 percent), and the Tintic district 5,025 tons (11 percent). The remainder came largely from lead ore from the West Mountain (Bingham) and Ophir districts, silver ore from the Park City region and Tintic and West Mountain (Bingham) districts, and zinc-lead ore from the Rush Valley (Stockton) district. Output of lead in the West Mountain (Bingham) district was 16 percent less than in 1949, in the Park City region 12 percent, and in the Tintic district 2 percent.

The United States & Lark property remained by far the largest producer of lead in Utah, although its output in 1950 was about 15 percent less than in 1949; it was followed by the properties of the Chief Consolidated Mining Co., Park Utah Consolidated Mines Co., New Park Mining Co., Butterfield group, Silver King Coalition Mines Co., Hidden Treasure mine (Ophir district), and Honorine and Calumet mines (Rush Valley district). These nine producers supplied 95 percent of the State lead.

Zinc.—Utah's output of recoverable zinc in 1950 was 31,678 short tons, the smallest since 1946 and 22 percent less than in 1949. This loss resulted mainly from the closing during part of the year of the United States & Lark property at Bingham and from a reduced zinc production from mines in the Park City, Ophir, and Rush Valley (Stockton) districts. In 1950 zinc-lead ore from the West Mountain (Bingham) district supplied 16,120 tons of zinc (51 percent of the State total), the Park City region 7,348 tons (23 percent), and the Tintic district 5,972 tons (19 percent). The remainder came largely from zinc-lead ore from the Ophir and Rush Valley districts and from zinc ore and slag from the Big Cottonwood and Smelter (Tooele) districts. Production of zinc in the West Mountain (Bingham) district was 28 percent less than in 1949, in the Park City region 11 percent, in the Ophir district 63 percent, in the Smelter (Tooele) district 59 percent, and in the Rush Valley district 32 percent. Zinc output in the Tintic district in 1950 was nearly the same as in 1949.

The United States & Lark property remained by far the largest producer of zinc in Utah, although its output in 1950 was about 27 percent less than in 1949; it was followed by the properties of the Chief Consolidated Mining Co., Park Utah Consolidated Mines Co., New Park Mining Co., Butterfield group, Honorine mine, Cardiff mine, Hidden Treasure mine, and Calumet mine. These nine properties furnished 97 percent of the State total zinc.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by counties, in terms of recoverable metal

County	Mines producing		Ore, old tailings, etc. (short tons)	Gold (lode and placer)		Silver	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Beaver	3		10,476	48	$1,680	2,402	$2,174
Box Elder	1		153			32	29
Grand		1		1	35		
Juab	16		180,809	2,655	92,925	881,805	798,078
Millard	3	1	70	6	210	210	190
Piute	1		1	5	175		
Salt Lake	11		31,414,685	428,718	15,005,130	5,019,321	4,542,739
San Juan			5				
Sevier	1		17				
Summit	9		139,137	3,002	105,070	556,000	503,208
Tooele	25		30,370	1,367	47,845	181,022	163,834
Utah	10		9,266	625	21,875	46,299	41,903
Wasatch	3		70,503	21,123	739,305	396,632	358,972
Washington	1		109	1	35	85	77
Total: 1950	84	2	31,855,601	457,551	16,014,285	7,083,808	6,411,204
1949	93	2	21,993,467	314,058	10,992,030	6,724,880	6,086,356

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Beaver	161,300	$33,550	29,400	$3,969	4,000	$568	$41,941
Box Elder	23,100	4,805					4,834
Grand							35
Juab	256,600	53,373	12,622,600	1,704,051	11,957,700	1,697,993	4,346,420
Millard	3,800	790	5,600	756	100	14	1,960
Piute							175
Salt Lake	555,473,000	115,538,384	56,322,400	7,603,524	33,144,900	4,706,576	147,396,353
San Juan	2,100	437					437
Sevier			200	27	4,300	611	638
Summit	230,200	47,882	9,341,000	1,261,035	7,736,500	1,098,583	3,015,778
Tooele	419,000	87,152	4,960,600	669,681	3,360,500	477,191	1,445,703
Utah	42,700	8,882	489,200	66,042	35,500	5,041	143,743
Wasatch	604,300	125,694	5,734,800	774,198	7,112,500	1,009,975	3,008,144
Washington	43,900	9,131	200	27			9,270
Total: 1950	557,260,000	115,910,080	89,506,000	12,083,310	63,356,000	8,996,552	159,415,431
1949	394,490,000	77,714,530	106,144,000	16,770,752	81,340,000	10,086,160	121,649,828

MINING INDUSTRY

Low zinc and lead prices during the first half of 1950, a labor strike part of the year at the two principal zinc-lead districts—Bingham and Park City—in Utah, and a 3-month fire at the Lark zinc-lead mine caused a marked decline in the quantity of zinc-lead ore mined in Utah in 1950. Nevertheless, the State total ore mined and treated increased from 21,993,467 tons in 1949 to 31,855,601 tons in 1950, owing mainly to an increase of 10,125,367 tons (48 percent) in output of copper ore. Continuous operations at the Utah Copper open pit at Bingham, Utah's only outstanding copper mine, resulted in the greatest output of copper ore since 1943. Of the 579,946 tons of zinc-lead ore mined in Utah in 1950, 316,148 tons (55 percent) came from the Bingham district, 122,001 tons (21 percent) from the Tintic district, 120,129 tons (21 percent) from the Park City region, and 14,357 tons (2 percent) from the Rush Valley (Stockton) district. Of the 28,363 tons of lead ore mined in 1950, 15,681 tons (55 percent) came from the Bingham district, 4,303 tons (15 percent) from the Ophir district, and 3,353 tons (12 percent) from the Smelter (Murray) district. The siliceous material was largely silver ore and old tailings from the Park City, Tintic, and Bingham districts. One of the most significant projects started during the year involved the driving of a haulage tunnel 21,300 feet long from Bingham to Lark. The project is being carried on under an agreement between the United States Smelting, Refining & Mining Co. and the Kennecott Copper Corp. The tunnel is being driven to permit the Kennecott Copper Corp. to extend its open-pit operations toward the southwest.

Active lode mines in the State dropped 10 percent, from 93 in 1949 to 84 in 1950; the number of active placers remained the same (2).

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines[1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	4	1,234	274	1,826	2,170	43,335	----------
Dry gold-silver ore	10	12,824	1,362	59,540	98,091	582,174	22,427
Dry silver ore	13	133,946	2,691	489,815	313,583	2,712,408	100
Total	24	148,004	4,327	551,181	413,844	3,337,917	22,527
Copper ore	12	31,049,641	413,090	3,312,949	[2] 553,681,586	14,030	----------
Lead ore	35	28,363	1,739	189,405	265,376	5,772,066	86,644
Lead-copper ore	1	432	58	5,782	31,150	70,302	----------
Zinc ore	4	[3] 5,535	18	4,528	14,601	164,024	1,411,935
Zinc-lead ore	31	579,946	37,324	2,849,674	2,780,080	78,698,136	61,734,197
Total	64	31,663,917	452,229	6,362,338	[2] 556,772,793	84,718,558	63,232,776
Old tailings [4]	5	43,680	991	170,289	73,363	1,449,525	100,697
Total lode mines	84	31,855,601	457,547	7,083,808	[2] 557,260,000	89,506,000	63,356,000
Gravel (placer operations)	2	----------	4	----------	----------	----------	----------
Total: 1950	86	31,855,601	457,551	7,083,808	[2] 557,260,000	89,506,000	63,356,000
1949	95	21,993,467	314,058	6,724,880	[5] 394,490,000	106,144,000	81,340,000

[1] Does not include operations processing only old slag or mill and smelter cleanings; data for such operations are, however, included in other columns. Detail will not add to totals because some mines produce more than 1 class of ore.
[2] Includes 14,561,870 pounds recovered from mine-water precipitates.
[3] Includes 3,843 tons of zinc slag.
[4] Silver 36,841 tons, gold-silver 4,339 tons, zinc 2,500 tons.
[5] Includes 15,822,418 pounds recovered from mine-water precipitates.

METALLURGICAL INDUSTRY

The 31,855,601 tons of ore produced in Utah in 1950 included the following: 31,628,415 tons (99 percent) treated at mills (21,811,661 tons in 1949); 223,343 tons (1 percent) shipped crude to smelters (164,326 tons in 1949); and 3,843 tons of old slag smelted and fumed (17,480 tons in 1949).

The nine mills active in Utah in 1950 treated Utah ore and tailings as follows: Three plants (Arthur, Magna, and Horn Silver), 31,047,220 tons of copper ore (the Horn Silver mill also treated 1,006 tons of lead ore); five mills (Bauer, Midvale, Silver King, Tooele, and United Mining Development Co.), 577,689 tons of zinc-lead ore; and one flotation mill in Summit County, 2,500 tons of current zinc tailings.

The Magna and Arthur concentrators (40,000 tons capacity each) of the Kennecott Copper Corp. operated continuously in 1950, except for a 1-day shut-down caused by collapse of a dewatering box, on copper ore from the Utah Copper open pit at Bingham. The Midvale 1,700-ton concentrator of the United States Smelting, Refining & Mining Co. operated 10 months of the year (idle July and August due to a labor strike), largely on zinc-lead ore from company-owned properties in the West Mountain (Bingham) district and from the property of the New Park Mining Co. in the Park City region. The 1,500-ton concentrator of the International Smelting & Refining Co. at Tooele operated throughout the year, mainly on zinc-lead ore supplied by operators in the Park City region and in the Tintic district; the copper unit at the concentrator remained idle. The 700-ton concentrator of the Combined Metals Reduction Co. at Bauer operated continuously, largely on zinc-lead ore supplied by company-owned or operated mines in Utah and Idaho and by the Chief Consolidated Mining Co. After a shut-down of nearly 16 months, the 800-ton concentrator of the Silver King Coalition Mines Co. at Park City began operating again October 16 on zinc-lead ore from the company-owned mine. The 500-ton concentrator of the Metal Producers, Inc. (Horn Silver), near Milford operated part of the year on copper ore from the O. K. mine and part of the year on lead ore from the Horn Silver mine.

The Garfield copper smelter of the American Smelting & Refining Co. operated continuously, principally on copper concentrates from the Magna and Arthur mills, siliceous crude ore from mines and dumps in the Park City, Tintic, and Bingham districts, and iron concentrates from the Bauer, Tooele, and Midvale mills. The Midvale lead smelter of the United States Smelting, Refining & Mining Co. operated 10 months of the year and treated lead concentrates, lead ores, gold and silver ores, and dump slag, chiefly from company-owned properties in Utah. The Tooele lead plant of the International Smelting & Refining Co. operated all year in conjunction with the company zinc-fuming plant and treated zinc-lead ore, lead ore and concentrates, and zinc ore and old slag from both company and custom sources. The fuming plant treated a total of 87,761 tons of current hot slag, old cold slag, and crude ore in 1950 compared with 107,774 tons in 1949; output in 1950 was 15,835 tons of zinc fume, averaging 74.17 percent zinc and 2.46 percent lead, and 2,312 tons of lead fume, averaging 50.56 percent lead and 18.36 percent zinc. The company copper smelter at Tooele remained idle all of 1950.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	4				
Smelting of:					
Ore	5,873	747,875	743,662	9,081,219	1,059,867
Old tailings	990	170,169	73,188	1,446,653	83,250
Old slag and mill and smelter cleanings	837	50,419	376,555	818,140	890,083
Concentrate [1]	449,847	6,115,345	541,504,725	78,159,988	61,322,800
Precipitates (copper) [2]			14,561,870		
Total: 1950	457,551	7,083,808	557,260,000	89,506,000	63,356,000
1949	314,058	6,724,880	394,490,000	106,144,000	81,340,000

[1] Includes concentrate produced from 2,500 tons of zinc tailings. [2] All from Salt Lake County.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal [1]

A. For ore and old tailings treated at mills

	Material treated (short tons)	Concentrate shipped to smelters and recoverable metal					
		Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES							
Beaver	10,426	368	42	2,151	155,600	16,745	1,800
Juab	120,489	23,491	820	550,817	128,987	9,672,913	11,704,209
Salt Lake	31,355,831	951,263	426,044	4,821,377	[2] 555,062,320	50,978,246	32,398,957
Summit	52,149	17,804	1,447	242,925	38,805	8,596,062	7,600,707
Tooele	18,922	6,448	369	102,068	76,383	3,149,503	2,492,254
Utah	118	32	2	691	500	16,519	13,073
Wasatch	70,480	17,068	21,123	395,316	604,000	5,730,000	7,111,800
Total: 1950	31,628,415	1,016,474	449,847	6,115,345	[2] 556,066,595	78,159,988	61,322,800
1949	21,811,661	827,219	305,047	5,894,423	[2] 392,957,349	96,895,957	77,884,012
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS							
Copper		846,448	412,569	3,291,962	[2] 553,295,670	----	----
Lead		66,533	23,122	2,284,854	1,667,912	70,566,413	1,935,086
Zinc		57,794	5,658	393,864	848,955	5,902,745	59,189,418
Zinc-lead		13	----	14	----	3,650	1,900
Iron (from zinc-lead ore)		45,686	8,498	144,651	254,058	1,687,180	196,396
Total 1950		1,016,474	449,847	6,115,345	[2] 556,066,595	78,159,988	61,322,800

B. For ore, old tailings, etc., shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaver	50	6	251	5,700	12,655	2,200
Box Elder	153	----	32	23,100	----	----
Juab	60,320	1,835	330,988	127,613	2,949,687	253,491
Millard	70	3	210	3,800	5,600	100
Piute	1	5	----	----	----	----
Salt Lake	58,854	2,674	197,944	410,680	5,344,154	745,943
San Juan	5	----	----	2,100	----	----
Sevier	17	----	----	----	200	4,300
Summit	86,988	1,555	313,075	191,395	744,938	135,793
Tooele	[3] 11,448	998	78,954	342,617	1,811,097	868,246
Utah	9,148	623	45,608	42,200	472,681	22,427
Wasatch	23	----	1,316	300	4,800	700
Washington	109	1	85	43,900	200	----
Total: 1950	[3] 227,186	7,700	968,463	1,193,405	11,346,012	2,033,200
1949	[4] 181,806	8,999	830,457	1,532,651	9,248,043	3,455,988
BY CLASS OF MATERIAL						
Dry gold	1,234	274	1,826	2,170	43,335	----
Dry gold-silver	17,163	1,576	76,862	108,991	832,174	22,427
Dry silver	170,787	3,467	642,662	375,871	3,909,061	83,350
Copper	2,421	521	20,987	385,916	14,030	----
Lead	27,357	1,730	188,847	264,576	5,755,321	84,844
Lead-copper	432	58	5,782	31,150	70,302	----
Zinc	5,535	18	4,528	14,601	164,024	1,411,935
Zinc-lead	2,257	56	26,969	10,130	557,765	430,644
Total 1950	[3] 227,186	7,700	968,463	1,193,405	11,346,012	2,033,200

[1] No bullion produced in 1950.
[2] Includes copper recovered from smelting of mine-water precipitates as follows: 1950—14,561,870 pounds; 1949—15,822,418 pounds.
[3] Includes 3,843 tons of old slag.
[4] Includes 17,480 tons of old slag.

Construction of the $16,000,000 copper refinery of the Kennecott Copper Corp. and the copper-anode plant of the American Smelting & Refining Co., both at Garfield, was completed in September, and the first shipment of wire bars was made October 17. Wire bars will constitute the principal production of the refinery, although some cathode sheets will be shipped as well.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content [1]

Class of material	Quantity treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE AND OLD TAILINGS TREATED AT MILLS						
Copper	31,047,220	574,648	3,890,249	594,241,710		
Lead	1,006	13	700	1,000	22,000	5,000
Zinc	2,500	3	300	500	10,000	50,000
Zinc-lead	577,689	47,996	3,271,198	3,836,795	90,339,057	78,883,157
Total: 1950	31,628,415	622,660	7,162,447	598,080,005	90,371,057	78,938,157
1949	21,811,661	420,793	7,021,319	415,449,070	110,010,289	102,158,888
CONCENTRATE SHIPPED TO SMELTERS						
Copper	846,448	412,569	3,291,962	[1] 564,588,831		
Lead	66,533	23,122	2,284,854	2,183,549	72,945,287	8,414,764
Zinc	57,794	5,660	394,053	893,919	6,218,999	60,742,619
Zinc-lead	13		14		3,752	2,100
Iron (from zinc-lead ore)	45,686	8,498	144,651	267,629	2,408,566	2,347,082
Total: 1950	1,016,474	449,849	6,115,534	[1] 567,933,928	81,576,604	71,506,565
1949	827,219	305,065	5,904,178	[1] 401,547,873	101,099,954	91,807,722
ORE, OLD TAILINGS, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold	1,234	274	1,826	2,257	65,356	
Dry gold-silver	17,163	1,576	76,862	112,592	1,213,313	41,143
Dry silver	170,787	3,467	642,662	392,388	5,975,703	635,610
Copper	2,421	521	20,987	399,998	21,198	
Lead	27,357	1,730	188,847	349,865	6,066,007	1,501,541
Lead-copper	432	58	5,782	37,114	76,089	
Zinc	[2] 5,535	26	5,238	34,520	169,382	1,772,734
Zinc-lead	2,257	56	26,969	12,035	567,567	539,045
Total: 1950	[2] 227,186	7,708	969,173	1,340,769	14,154,615	4,490,073
1949	[3] 181,806	9,003	830,848	1,629,073	12,201,991	5,372,357

[1] Includes copper content of mine-water precipitates as follows: 1950—14,858,820 pounds; 1949—16,063,930 pounds.
[2] Includes 3,843 tons of old slag.
[3] Includes 17,480 tons of old slag.

REVIEW BY COUNTIES AND DISTRICTS

BEAVER COUNTY

Beaver Lake District.—Metal Producers, Inc., operated the O. K. mine 3 months in 1950 and hauled 9,420 tons of dump ore to its 500-ton flotation mill near Milford; the mill recovered 323 tons of concentrate containing 33 ounces of gold, 1,593 ounces of silver, and 158,907 pounds of copper. In addition, 32 tons of mine copper ore were shipped to the smelter at Garfield.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Utah in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore, old tailings, etc. (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Beaver County:									
Beaver Lake	1		9,452	35	1,665	160,400			$36,095
Granite	1		10	3	52	100	4,600	2,200	1,106
San Francisco	1		1,014	10	685	800	24,800	1,800	4,740
Box Elder County: Lucin	1		153		32	23,100			4,834
Grand County: Colorado River		1		1					35
Juab County:									
Fish Springs	2		43	1	2,570	200	36,000	2,500	7,618
Mount Nebo (Mona)	2		23		74		5,400	6,000	1,648
Tintic [1]	11		180,698	2,653	879,098	256,400	12,569,800	11,945,700	4,335,026
West Tintic	1		45	1	63		11,400	3,500	2,128
Millard County:									
Detroit (Drum Mountain)	1		33	3	73	3,800			961
Gandy	1		4		84		200	100	117
Gordon (Dog Valley)	1		33		53		5,400		777
House Mountains		1		3					105
Piute County: Ohio	1		1	5					175
Salt Lake County:									
Big Cottonwood	2		3,429	35	16,515	42,500	607,600	789,300	219,119
Little Cottonwood	3		598	15	6,908	11,500	134,200	77,600	38,305
Smelter	(2)		4,857	355	32,312	108,600	637,600	37,400	155,645
West Mountain (Bingham)	6		31,405,801	428,313	4,963,586	555,310,400	54,943,000	32,240,600	146,983,284
San Juan County: LaSal	(3)		5			2,100			437
Sevier County: Redmond	1		17				200	4,300	638
Summit County: Uintah	9		139,137	3,002	556,000	230,200	9,341,000	7,736,500	3,015,778
Tooele County:									
Blue Bell	1		67	1	1,221	100	46,600		7,452
Clifton	5		175	31	1,696	15,500	11,800		7,437
Columbia	1		1				200	200	55
Dugway	4		261	1	242	400	29,400	51,000	11,548
Erickson	2		1,162	2	706		134,400	123,500	36,390
Ophir	5		7,900	103	65,561	92,800	1,896,000	748,300	444,462
Rush Valley	5		14,958	375	95,324	45,100	2,641,800	1,633,700	697,407
Smelter	(2)		5,602	475	15,051	264,400	144,600	803,800	218,903
Third Term	1		26		105	100	5,800		899
Willow Springs	1		218	379	1,116	600	50,000		21,150
Utah County:									
American Fork	3		94	1	675	500	18,600	10,400	4,738
Tintic [1]	7		9,172	624	45,624	42,200	470,600	25,100	139,005
Wasatch County:									
Blue Ledge	1		70,480	21,123	395,316	604,000	5,730,000	7,111,800	3,006,144
Snake Creek	2		23		1,316	300	4,800	700	2,000
Washington County: Tutsagubet	1		109	1	85	43,900	200		9,270
Total Utah	84	2	31,855,601	457,551	7,083,808	557,260,000	89,506,000	63,356,000	159,415,431

[1] Tintic district lies in both Juab and Utah Counties.
[2] Production came from old smelter cleanings; not counted as a mine.
[3] Production came from old mill cleanings; not counted as a mine.

Granite District.—Output in 1950 was 10 tons of carbonate zinc-lead ore shipped to a smelter from the Beaver View group near Milford.

San Francisco District.—Metal Producers, Inc., worked the Horn Silver mine 6 months in 1950 and hauled 1,006 tons of lead ore to its 500-ton flotation mill, which recovered 45 tons of concentrate containing 9 ounces of gold, 558 ounces of silver, 925 pounds of copper, 17,138 pounds of lead, and 2,365 pounds of zinc. Leasing operations at the Horn Silver mine also produced 8 tons of high-grade lead-silver ore.

BOX ELDER COUNTY

Lucin District.—A. W. Jeffs and the Copper Mountain Co. worked the Copper Mountain (Salt Lake Copper) group near Montello, Nev., a few months in 1950 and shipped 153 tons of ore containing 32 ounces of silver and 23,670 pounds of copper.

JUAB COUNTY

Fish Springs District.—Lessees operated the Utah Mine group near Callao in 1950 and shipped 42 tons of ore containing 1 ounce of gold, 2,540 ounces of silver, 253 pounds of copper, 36,326 pounds of lead, and 5,000 pounds of zinc. A small lot of lead-silver ore was produced from the West Utah claim.

Mount Nebo (Mona) District.—Zinc ore (15 tons) was produced from the Little Eva mine and lead ore (8 tons) from the Vagabond claim.

Tintic District.—The Tintic district lies in both Juab and Utah Counties. Table 10 gives metal production in each section of the district in 1950, as well as the district total for prior years.

Chief Consolidated Mining Co. operated throughout the year its Chief No. 1 and Eureka Hill mines and old tailing dump in the Juab County part of the district. The company output of ore in 1950 was by far the largest in the entire district. According to the company annual report for 1950, the Chief No. 1 mine produced 116,573 tons of zinc-lead ore, 13,920 tons of siliceous silver ore, and 4,062 tons of lead-silver ore; and the Eureka Hill mine produced 1,350 tons of siliceous silver ore and 54 tons of lead-silver ore. All the ores together con-

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Tintic district, Juab and Utah Counties, Utah, 1946–50, and total, 1869–1950, in terms of recoverable metal

	Mines producing	Ore and old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946	19	132,326	17,799	619,724	225	4,239	3,710	$3,025,794
1947	27	167,384	15,385	1,076,726	550	6,166	3,969	4,480,038
1948	21	175,897	11,007	1,123,460	501	5,970	3,680	4,735,701
1949	15	160,448	5,133	914,150	263	6,676	6,082	4,728,346
1950:								
Juab County	11	180,698	2,653	879,098	128	6,285	5,973	4,335.026
Utah County	7	9,172	624	45,624	21	235	12	139,005
Total 1950	18	189,870	3,277	924,722	149	6,520	5,985	4,474,031
Total 1869–1950	--------	[1] 15,572,260	2,623,175	263,854,787	122,836	957,261	54,214	411,945,028

[1] Figures estimated for certain years before 1901.

tained 2,904 ounces of gold, 829,276 ounces of silver, 15,571,543 pounds of lead, and 16,664,001 pounds of zinc. In addition, the company shipped 33,325 tons of old tailings containing 700 ounces of gold, 130,000 ounces of silver, 46,000 pounds of copper, and 1,600,000 pounds of lead. Most of the Chief No. 1 zinc-lead ore was shipped to the custom flotation mill of the Combined Metals Reduction Co. at Bauer.

Lessees worked other properties in the Juab County part of the district; shipments in 1950 comprised 5,901 tons of silver ore and 131 tons of lead-silver ore from the American Star mine; 5,296 tons of silver ore, 1,467 tons of zinc-lead ore, 422 tons of gold-silver ore, and 115 tons of lead ore from the Godiva mine; 1,856 tons of gold-silver ore and 122 tons of lead ore from the Centennial-Beck-Victoria group; 1,175 tons of gold-silver ore from the Empire group; 366 tons of lead ore and 300 tons of zinc-lead ore from the Chief No. 2 mine; 97 tons of silver ore from the Showers waste dump; 93 tons of gold-silver ore from the Victor group; and small lots of lead ore and silver ore from the Bonnie Lee and Windridge claims.

In the Utah County part of the district, 4,339 tons of old gold-silver tailings were shipped from the Harold dump; 1,700 tons of gold-silver ore and 42 tons of zinc-lead ore from the Mountain View group; 1,174 tons of gold ore from the Colorado mine; 1,081 tons of silver ore and 10 tons of lead ore from the Tintic Standard waste dump; 412 tons of copper ore from the Eureka Lilly mine; 312 tons of gold-silver ore and 74 tons of lead ore from the Yankee mine; and 28 tons of gold-silver ore from the Iron Blossom waste dump.

West Tintic District.—Leasing operations at the "88" claim near Jericho produced 45 tons of ore containing 1 ounce of gold, 63 ounces of silver, 11,545 pounds of lead, and 4,375 pounds of zinc.

MILLARD COUNTY

Detroit District.—Cherry & Berry worked the E. P. H. claim (Ibex group) in 1950 and shipped 33 tons of copper ore to the smelter at Garfield.

Gordon District.—Lessees operated the Blue Bell group near Kanosh a short time in 1950 and shipped 33 tons of lead ore to the smelter at Midvale.

SALT LAKE COUNTY

Big Cottonwood District.—Cardiff Mining & Milling Co. operated the Cardiff mine throughout the year and produced 1,709 tons of sulfide zinc-lead ore, which was treated in a custom flotation mill at Midvale; 332 tons of carbonate zinc-lead ore and 199 tons of carbonate lead ore, which were shipped direct to smelters; and 1,132 tons of carbonate zinc ore, which was shipped to the zinc fuming plant at Tooele. The total ore contained 38 ounces of gold, 17,929 ounces of silver, 61,158 pounds of copper, 662,513 pounds of lead, and 999,210 pounds of zinc. The remainder of the district output was 57 tons of silver ore produced from the Lake Blanche group.

Little Cottonwood District.—Output in 1950 was 598 tons of ore containing 16 ounces of gold, 7,040 ounces of silver, 13,229 pounds of copper, 139,605 pounds of lead, and 122,740 pounds of zinc. The principal output was 506 tons of zinc-lead ore from the Columbus-

Rexall and South Hecla groups, while the remainder came from the Drain Tunnel property.

Smelter District.—In 1950 some ore and smelter cleanings from the lead smelter of the American Smelting & Refining Co. at Murray were shipped by various lessees to smelters in Utah and Colorado. The total amounted to 3,706 tons containing 355 ounces of gold, 31,304 ounces of silver, 123,427 pounds of copper, 685,536 pounds of lead, and about 150,000 pounds of zinc. The rest of the district output was some old slag (1,151 tons) from the Midvale and Sandy smelter dumps.

West Mountain (Bingham) District.—In 1950 the West Mountain (Bingham) district produced 94 percent of the State gold, 70 percent of the silver, more than 99 percent of the copper, 61 percent of the lead, and 51 percent of the zinc; total value of the five metals represented 92 percent of the State total. Output was 31,037,812 tons of copper ore, 316,213 tons of zinc-lead ore, 36,095 tons of siliceous silver ore and gold-silver ore, 15,681 tons of lead ore, and 9,121 tons of copper precipitates.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in West Mountain (Bingham) district, Salt Lake County, Utah, 1946–50, and total, 1865–1950, in terms of recoverable metal

Year	Number of mines	Ore (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946	6	12, 572, 289	140, 877	2, 030, 182	112, 083	12, 343	7, 593	$47, 429, 473
1947	5	29, 306, 718	384, 414	4, 816, 611	264, 315	26, 163	20, 446	141, 308, 766
1948	6	24, 889, 134	332, 588	4, 694, 674	225, 225	30, 672	22, 077	130, 490, 268
1949	5	21, 405, 489	286, 155	4, 316, 378	196, 101	32, 600	22, 311	107, 020, 080
1950	6	31, 405, 801	428, 313	4, 963, 586	277, 655	27, 472	16, 120	146, 983, 284
Total 1865–1950		[1] 630,310,792	7, 275, 499	161, 915, 772	5, 633, 616	1, 678, 936	560, 651	2, 328, 229, 263

[1] Figures estimated for certain years before 1901.

Steady operations throughout 1950 at the Utah Copper mine of the Kennecott Copper Corp. resulted in the largest output of copper ore since 1943 and 10,115,500 tons more (48 percent) than in 1949. The corporation announced that its Utah Copper division established a 6-year record copper production in 1950 with 554,995,248 net pounds of copper, compared with the previously higher record in 1944 of 555,067,885 net pounds; in 1949 output was 394,667,367 net pounds. In 1950 the Utah Copper division moved 41,342,160 tons of waste and treated 31,037,800 tons of copper ore in its two flotation mills at Arthur and Magna, compared with 26,581,965 tons of waste and 20,922,300 tons of copper ore in 1949. The two milling plants maintained a schedule of 6 days per week and three shifts per day throughout the year. Average grade of ore mined in 1950 was 0.957 percent copper, but the greatest advancement in mining operations is the mining of sizable blocks of ore containing as little as 0.40 percent copper. The property is not only the largest producer of copper in the State, but in 1950 it was also the largest producer of gold and silver in the State and the second-largest producer of molybdenum in the United States.

Since the beginning of operations in 1904 and to the end of 1950, the Utah Copper division has moved about 703,000,000 short tons of overburden, mined and milled 589,000,000 short tons of copper ore, and produced 5,256,677 net tons of copper.

In 1950 output of zinc-lead ore from the West Mountain (Bingham) district dropped to 316,213 tons, a decline of 117,916 tons (27 percent) from that in 1949. This decline resulted from the temporary shutdown of the United States & Lark property of the United States Smelting, Refining & Mining Co., the largest producer of zinc-lead ore in the State. Operations at the Lark mine ceased July 16, when the lower levels of the mine caught fire, and were not resumed until October 28; the United States mine was idle 2 months during the summer due to a labor strike. Output from both mines in 1950 was 290,472 tons of zinc-lead milling ore, 36,025 tons of siliceous silver ore and gold-silver smelting ore, and 15,553 tons of lead smelting ore.

Combined Metals Reduction Co. and lessees operated the Butterfield group continuously and shipped 24,634 tons of zinc-lead ore to the Combined Metals custom flotation mill at Bauer; the output was 13,666 tons less than in 1949. In addition, 70 tons of gold-silver ore and silver ore were shipped to a smelter. The milling ore contained 1,677 ounces of gold, 259,175 ounces of silver, 100,000 pounds of copper, 5,916,800 pounds of lead, and 2,232,940 pounds of zinc.

Remaining district production was largely 704 tons of zinc-lead ore and 122 tons of lead ore from the Columbia group, operated by lessees.

SUMMIT AND WASATCH COUNTIES

PARK CITY REGION

The Park City region includes the Uintah district in Summit County and the Blue Ledge and Snake Creek districts in Wasatch County. Table 12 shows the production and total value of the five metals in 1950 compared with 1946–49 and the total from 1870 to 1950.

After the closing in 1949 of nearly all mines in the Park City region, owing to a drop in base-metal prices, the mines were reopened in 1950 as a result of a substantial rise in the market prices of copper, lead, and zinc. The New Park Mining Co. operated its property in the Blue Ledge district throughout 1950, and it was the leading producer in the Park City region. The company reported that 70,480 tons of

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in Park City region, Summit and Wasatch Counties, Utah, 1946–50, and total, 1870–1950, in terms of recoverable metal

Year	Number of mines	Ore and old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1946	9	336,474	16,956	1,009,422	446	8,373	8,876	$5,544,668
1947	10	657,496	17,052	1,352,748	570	10,987	10,956	7,875,999
1948	10	506,671	19,087	1,703,864	597	12,670	10,320	9,749,907
1949	10	318,341	19,443	1,061,902	451	8,583	8,359	6,604,858
1950	12	209,640	24,125	952,632	417	7,538	7,425	6,023,922
Total 1870–1950		[1] 16,077,148	641,513	239,845,846	36,354	1,244,000	379,966	397,439,007

[1] Figures estimated for certain years before 1901.

zinc-lead milling ore were shipped in 1950 compared with 64,738 tons in 1949. The ore in 1950, containing 25,254 ounces of gold, 425,737 ounces of silver, 834,293 pounds of copper, 6,324,402 pounds of lead, and 8,767,300 pounds of zinc, was treated in the custom flotation mill of the United States Smelting, Refining & Mining Co. at Midvale. The New Park Mining Co. announced that a new level was opened in 1950 with favorable ore developments on both the Mayflower and Pearl fissures and that additional mining property was acquired during the year.

Due to low zinc and lead prices during the first half of 1950 and failure of wage negotiations, only maintenance work was done at the Judge unit of the Park Utah Consolidated Mines Co. The company operated its Keetley unit with a reduced crew to August 1, but both units resumed operations August 22 upon settlement of a new labor contract. The company reported that a total of 38,231 tons of zinc-lead milling ore was shipped in 1950 compared with 39,410 tons in 1949. The ore in 1950, containing 1,232 ounces of gold, 176,833 ounces of silver, 9,358 pounds of copper, 6,891,448 pounds of lead, and 8,170,340 pounds of zinc, was treated in the custom flotation mill of the International Smelting & Refining Co. near Tooele.

After a shut-down of 16 months, the 800-ton concentrator of the Silver King Coalition Mines Co. at Park City resumed operation October 16 on zinc-lead ore from the company-owned mine in the Uintah district of the Park City region. The company reported that 11,418 tons of ore were milled in 1950, which contained 500 ounces of gold, 84,000 ounces of silver, 45,000 pounds of copper, 2,466,000 pounds of lead, and 765,000 pounds of zinc.

McFarland & Hullinger worked the Daly No. 1 waste dump 5 months and shipped 80,010 tons of siliceous ore, which contained 1,410 ounces of gold, 270,590 ounces of silver, 169,780 pounds of copper, and 635,496 pounds of lead. McFarland & Hullinger also worked the Ontario waste dump and the Grasselli tailing dump a few months in 1950 and shipped 2,684 tons of siliceous silver ore from the waste dump and 2,939 tons of silver-lead-zinc material from the tailing dump. The rest of the district output comprised 498 tons of lead ore from the Silver King Western mine; 2,500 tons of current zinc tailings from the Silver King Coalition mill re-treated by Reuben Garbett; 458 tons of old silver tailings from the Atkinson property; 363 tons of mill cleanings containing principally silver, lead, and zinc shipped from the Pacific Bridge mill site; 36 tons of gold-silver ore produced from the Park Flag mine; 11 tons of lead-silver ore and 8 tons of zinc ore shipped from the New Quincy property; and 4 tons of high-grade lead-silver ore produced from the Revelator claim.

TOOELE COUNTY

Blue Bell District.—Lessees continued working the Blackhawk claim near Vernon and shipped 67 tons of lead ore.

Clifton (Gold Hill) District.—Five mines in the Clifton district produced 175 tons of ore in 1950 containing 31 ounces of gold, 1,696 ounces of silver, 16,049 pounds of copper, 14,355 pounds of lead, and

62 pounds of zinc. The main output was 139 tons of copper-silver ore produced from the Monocco mine.

Dugway District.—In 1950 Willis Smith operated four properties in the Dugway district. The principal output was 245 tons of zinc-lead ore produced from the Four Metals, Frances, and Raymond properties.

Erickson District.—The Bar X Mining Co. worked its Esther group most of the year and shipped 1,115 tons of milling ore containing 6 ounces of gold, 832 ounces of silver, 143,300 pounds of lead, and 147,745 pounds of zinc. The Ida-Desert View group produced 47 tons of zinc-lead ore.

Ophir District.—Lead ore (4,303 tons) and zinc-lead ore (1,642 tons) produced by lessees—McFarland & Hullinger—from the Hidden Treasure mine in 1950 were by far the chief output of the Ophir district. Other district production included 1,345 tons of zinc-lead ore from the Ophir unit of the United States Smelting, Refining & Mining Co.; 330 tons of zinc-lead ore and 117 tons of copper ore from the Ophir Hill mine; and 75 tons of lead-copper ore, 48 tons of copper ore, and 6 tons of zinc-lead ore from the Mono-Kearsarge group.

Rush Valley District.—The Combined Metals Reduction Co. operated the West Calumet (Calumet) and Honorine-Galena King properties throughout the year; however, ore output from the West Calumet mine dropped from 32,807 tons in 1949 to 6,378 tons in 1950, while that from the Honorine-Galena King group increased from 827 tons to 8,225 tons. The ore from both properties contained 1,094 ounces of gold, 115,501 ounces of silver, 60,266 pounds of copper, 3,043,321 pounds of lead, and 2,111,364 pounds of zinc; most of it (14,084 tons) was zinc-lead ore treated in the Combined Metals custom flotation mill at Bauer. Other district production was 273 tons of zinc-lead milling ore from the Silver Eagle mine (Hampton Mining Co., lessee), and 82 tons of lead smelting ore from the Bluestone and Blue Eagle groups.

Smelter District.—Output in 1950, all by International Smelting & Refining Co. plants near Tooele, comprised 2,097 tons of old zinc slag treated at the zinc-fuming plant, 1,746 tons of similar material smelted at the lead smelter, 451 tons of furnace cleanings (zinc) shipped from the zinc-fuming plant, and 1,308 tons of old smelter cleanings (copper) shipped from the copper smelter.

Third Term District.—Ray Mining & Development Co. worked the Third Term mine near Grantsville a few months in 1950 and shipped 26 tons of lead ore.

Willow Springs District.—Lessees continued working the Oro Del Rey group near Callao and shipped to smelters 218 tons of ore containing 379 ounces of gold, 1,116 ounces of silver, 688 pounds of copper, and 53,434 pounds of lead.

UTAH COUNTY

American Fork District.—Output in 1950 was 76 tons of zinc-lead milling ore from the Floral Lode and Silver Leaf properties and 18 tons of lead smelting ore from the Blue Rock (Pacific) mine.

Tintic District.—Mines in the Utah County section of the Tintic district are reviewed under Juab County.

WASATCH COUNTY

Park City Region.—Mines in the Wasatch County section of the Park City region are reviewed under Summit and Wasatch Counties.

WASHINGTON COUNTY

Tutsagubet District.—E. L. Cox operated the Dixie-Apex mine 18 miles southwest of St. George the last 4 months of the year and shipped 109 tons of ore containing 1 ounce of gold, 85 ounces of silver, 44,967 pounds of copper, and 475 pounds of lead.

Washington
Gold, Silver, Copper, Lead, and Zinc

(MINE REPORT)

By Almon F. Robertson and Virginia Halverson

GENERAL SUMMARY

INCREASED consumer demand for metals and advanced metal prices during the latter half of the year resulted in record high outputs of zinc, lead, and gold from Washington mines in 1950. Ore production rose to an all time high of 1,279,595 tons, an increase of slightly more than 26 percent over the 1,012,198 tons mined in 1949. Silver output increased slightly, as compared with 1949, whereas the production of copper fell off.

The output of gold increased 28 percent from 71,994 fine ounces in 1949 to 92,117 in 1950; silver output increased 2 percent from 357,853 fine ounces to 363,656; lead advanced 61 percent from 6,417 short tons to 10,334; and zinc rose 38 percent from 10,740 short tons to 14,807; copper output dropped from 5,275 short tons in 1949 to 5,057, a decline of 4 percent.

Total value of the five metals increased from $9,613,307 in 1949 to $12,652,302 in 1950, or nearly 32 percent. Expanded production from many of the mines, together with higher average prices for copper and zinc, were mainly responsible for the increase. The value of gold produced in 1950 was $3,224,095, or more than 25 percent of the State total value; silver, valued at $329,127, comprised nearly 3 percent; copper, $2,103,712, nearly 17 percent; lead, $2,790,180, slightly over 22 percent, and zinc, $4,205,188, more than 33 percent.

Chelan County remained in first place among Washington counties in tonnage of ore treated but was replaced by Pend Oreille County in value of metals produced.

All tonnage figures reported herein are short tons and "dry weight"; that is, they do not include moisture. The value of metal production has been calculated at the prices shown in table 1.

Gold.—The increase of 20,123 ounces in Washington gold output in 1950 resulted mainly from an increased production from the Gold King mine near Wenatchee, Chelan County. The Holden mine, also in Chelan County, remained the State's leading gold producer, followed closely by the Gold King mine. The Knob Hill mine in Ferry County ranked third, followed in order by the Alder group in Okanogan County and the Aurum group in Ferry County. The first three properties mentioned contributed nearly 97 percent of the State total gold output for 1950.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35.00	$0.808	$0.162	$0.109	$0.122
1947	35.00	.905	.210	.144	.121
1948	35.00	.905+	.217	.179	.133
1949	35.00	.905+	.197	.158	.124
1950	35.00	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver: Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947-$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

TABLE 2.—Mine production of gold, silver, copper, lead, and zinc, in Washington, 1946–50, and total, 1860–1950, in terms of recoverable metal [1]

Year	Lode mines		Placer mines		Gold (lode and placer)		Silver (lode and placer)	
	Number of mines	Ore sold or treated (short tons)	Number of mines	Gravel washed (cubic yards)	Fine ounces	Value	Fine ounces	Value
1946	16	858,023	5	25,115	51,168	$1,790,880	264,453	$213,678
1947	25	676,176	6	8,600	34,965	1,223,775	293,736	265,831
1948	30	974,257	1	2,900	70,075	2,452,625	375,831	340,146
1949	29	1,012,198	3	400	71,994	2,519,790	357,853	323,875
1950	27	1,279,595	6	1,365	92,117	3,224,095	363,656	329,127
1860–1950	----------	(2)	----------	(2)	2,447,821	64,429,058	14,220,949	10,368,492

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1946	4,527	$1,466,748	2,987	$651,166	11,329	$2,764,276	$6,886,748
1947	2,240	940,800	5,359	1,543,392	13,800	3,339,600	7,313,398
1948	5,665	2,458,610	7,147	2,558,626	12,638	3,361,708	11,171,715
1949	5,275	2,078,350	6,417	2,027,772	10,740	2,663,520	9,613,307
1950	5,057	2,103,712	10,334	2,790,180	14,807	4,205,188	12,652,302
1860–1950	97,163	28,281,981	105,020	19,066,994	189,800	35,948,664	158,095,189

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; and ore or copper precipitates shipped directly to smelters during the calendar year indicated.
[2] 1860–1903: Figures not available; 1904–50, 16,467,648 tons produced.

Placers yielded only 39 fine ounces of gold; it came from six producers, compared with three in 1949. About 64 percent of the State gold was recovered from gold ore and most of the remainder from zinc-copper ore.

Silver.—The Knob Hill mine (gold ore) was the leading silver producer in Washington in 1950; its output was about 36 percent greater than that of the Holden mine (zinc-copper ore), the next largest silver producer. Other important silver-producing properties, in order of decreasing output, were the Bonanza mine (lead ore), the Gold King mine (gold ore), and the Grandview mine (zinc-lead ore). These five mines contributed 94 percent of the State silver. In 1950 gold ore supplied about 50 percent of the State silver, zinc-

TABLE 3.—Gold produced at placer mines in Washington, 1946–50, by class of mine and by method of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Dragline dredges:					
1946	1	10,000	85	$2,975	$0.298
1947	1	3,500	14	490	.140
1948–50					
Nonfloating washing plants:[1]					
1946	1	15,000	11	385	.026
1947	3	4,700	56	1,960	.417
1948	1	2,900	10	350	.121
1949					
1950	1	8,000	31	1,085	.136
Small-scale hand methods:					
1946	3	115	5	175	1.522
1947	2	400	7	245	.613
1948					
1949	3	400	10	350	.875
1950	5	1,033	8	280	.271
Grand total placers:					
1946	5	25,115	101	3,535	.141
1947	6	8,600	77	2,695	.313
1948	1	2,900	10	350	.121
1949	3	400	10	350	.875
1950	6	9,033	39	1,365	.151

[1] Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by months, in terms of recoverable metal

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	7,928	30,248	432	927	1,157
February	12,070	37,043	467	852	1,121
March	8,334	33,628	522	902	1,179
April	8,067	28,675	435	872	1,132
May	7,089	27,471	412	1,042	1,236
June	6,688	25,186	427	722	1,166
July	6,649	29,060	357	812	1,252
August	7,716	35,053	482	922	1,417
September	7,624	31,737	407	807	1,259
October	6,516	25,879	342	932	1,331
November	6,624	28,830	367	682	1,236
December	6,812	30,846	407	862	1,321
Total: 1950	92,117	363,656	5,057	10,334	14,807
1949	71,994	357,853	5,275	6,417	10,740

copper ore 30 percent, and lead ore and zinc-lead ore most of the remainder.

Copper.—A decline of about 7 percent in the output of copper from the Holden mine in Chelan County was partly offset by increased production from the Alder group in Okanogan County, the Pend Oreille Mines in Pend Oreille County, and the Valley mine in Ferry County. Other properties in the State produced only small quantities of copper.

Lead.—Lead production in Washington in 1950 increased 61 percent over 1949 and was the largest annual output of any year in the State's history. Largely responsible for the record production were substantial increases in output from the Grandview mine in Pend Oreille

County and from the Bonanza mine in Stevens County. Lead output declined slightly at the Deep Creek and Anderson mine in Stevens County and at the property of the Pend Oreille Mines & Metals Co. in Pend Oreille County. The above four properties supplied over 99 percent of the State lead in 1950. About 72 percent of the total lead was derived from zinc-lead ore; nearly all the remainder was obtained from lead ore.

Zinc.—Production of recoverable zinc in Washington during 1950 established a record, owing mainly to a marked increase in tonnage of zinc-lead ore milled at the Grandview property. Production also increased at the Pend Oreille Mines but decreased at the Holden and Deep Creek and Anderson mines. The Grandview mine replaced the Pend Oreille Mines as the State's leading zinc producer, followed by the Holden and Deep Creek and Anderson mines. These four properties supplied nearly 99 percent of the State total zinc. Zinc-lead ore supplied nearly 75 percent of the total zinc in 1950, zinc-copper ore about 16 percent, and zinc ore nearly 9 percent.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by counties, in terms of recoverable metal

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Asotin		1	1	$35		
Chelan	3	1	64,711	2,264,885	137,483	$124,429
Ferry	4		24,929	872,515	152,671	138,175
Garfield		1	31	1,085	10	9
Kittitas	2		76	2,660	32	29
Okanogan	3	2	2,353	82,355	5,055	4,575
Pend Oreille	2				20,432	18,492
Snohomish		1	1	35		
Stevens	13		15	525	47,973	43,418
Total: 1950	27	6	92,117	3,224,095	363,656	329,127
1949	29	3	71,994	2,519,790	357,853	323,875

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Asotin							$35
Chelan	9,808,000	$2,040,064			4,859,000	$689,978	5,119,356
Ferry	9,600	1,997	1,200	$162	18,400	2,613	1,015,462
Garfield							1,094
Kittitas							2,689
Okanogan	278,800	57,990	20,800	2,808	3,000	426	148,154
Pend Oreille	15,500	3,224	14,889,000	2,010,015	22,064,000	3,133,088	5,164,819
Snohomish							35
Stevens	2,100	437	5,757,000	777,195	2,669,600	379,083	1,200,658
Total: 1950	10,114,000	2,103,712	20,668,000	2,790,180	29,614,000	4,205,188	12,652,302
1949	10,550,000	2,078,350	12,834,000	2,027,772	21,480,000	2,663,520	9,613,307

MINING INDUSTRY

Although the number of producing lode mines in Washington dropped from 29 in 1949 to 27 in 1950, ore output increased more than 26 percent to the highest annual level yet recorded. Considerably higher production in 1950, compared with 1949, was reported from the Grandview, Bonanza, Admiral, Knob Hill, and Holden mines. No serious work stoppages interfered with normal operations during the year.

ORE CLASSIFICATION

Details of ore classification are given in the Gold and Silver chapter of this volume.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by class of ore or other source material in terms of recoverable metal

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold ore	10	121,089	58,729	182,754	277,892		
Copper ore	1	286		385	9,508	1,000	
Lead ore	4	20,217		48,125	3,100	5,296,931	49,274
Zinc ore	3	62,206		1,515		445,008	2,592,181
Zinc-copper ore	1	657,634	33,347	109,406	9,808,000		4,859,000
Zinc-lead ore	9	418,163	2	21,461	15,500	14,925,061	22,113,545
Total lode mines	27	1,279,595	92,078	363,646	10,114,000	20,668,000	29,614,000
Gravel (placer operations)	6		39	10			
Total: 1950	33	1,279,595	92,117	363,656	10,114,000	20,668,000	29,614,000
1949	32	1,012,198	71,994	357,853	10,550,000	12,834,000	21,480,000

[1] Detail will not add to totals because some mines produce over 1 class of ore.

METALLURGICAL INDUSTRY

Of the 1,279,595 tons of lode material sold or treated in Washington in 1950, 1,235,765 tons (97 percent) went to mills and 43,830 tons (3 percent) to smelters compared with 98 and 2 percent, respectively, in 1949. The 1,235,765 tons treated at mills were distributed as follows: one plant, 657,634 tons of zinc-copper ore; four plants, 418,155 tons of zinc-lead ore; five plants, 77,273 tons of gold ore; three plants, 20,211 tons of lead ore; three plants, 62,206 tons of zinc ore; and one plant, 286 tons of copper ore.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by method of recovery, in terms of recoverable metal

Method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Placer	39	10			
Amalgamation	80	32			
Cyanidation	5,780	37,203			
Smelting of ore	31,763	32,120	92	6,254	1,554
Smelting of concentrate	54,455	294,291	10,113,908	20,661,746	29,612,446
Total: 1950	92,117	363,656	10,114,000	20,668,000	29,614,000
1949	71,994	357,853	10,550,000	12,834,000	21,480,000

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by method of recovery (except placer) and class of material processed, in terms of recoverable metal

A. For ore treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short ton)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Chelan	657,654	2,392	6,189	26,597	30,960	103,217	9,808,000		4,859,000
Ferry	56,440	3,380	30,961	1,239	21,150	117,853	9,508	1,200	18,400
Kittitas	275	75	32						
Okanogan	21,100			1,918	2,345	5,055	278,800	20,800	3,000
Pend Oreille	417,228			28,888		20,432	15,500	14,889,000	22,064,000
Stevens	83,068	13	53	6,709		47,734	2,100	5,750,746	2,668,046
Total: 1950	1,235,765	5,860	37,235	65,351	54,455	294,291	10,113,908	20,661,746	29,612,446
1949	994,458	7,920	39,589	52,887	56,955	292,438	10,521,500	12,716,592	21,463,675
BY CLASS OF CONCENTRATE SHIPPED TO SMELTERS									
Dry gold				1,195	21,150	117,425			
Copper				23,548	33,029	102,292	9,996,950	1,000	
Lead				14,201		69,590	5,865	20,156,630	334,717
Zinc				26,400	276	4,978	111,093	499,492	29,276,586
Zinc-lead				7		6		4,624	1,143
Total: 1950				65,351	54,455	294,291	10,113,908	20,661,746	29,612,446

B. For ore shipped directly to smelters

	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Chelan	41,756	31,358	28,077			
Ferry	2,048	399	3,857	92		
Kittitas	8	1				
Okanogan	4	3				
Stevens	14	2	186		6,254	1,554
Total: 1950	43,830	31,763	32,120	92	6,254	1,554
1949	17,740	7,109	25,826	28,500	117,408	16,325
BY CLASS OF MATERIAL						
Dry gold	43,816	31,761	31,934	92		
Lead	6		7		3,254	254
Zinc-lead	8	2	179		3,000	1,300
Total: 1950	43,830	31,763	32,120	92	6,254	1,554

232294—53——102

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by method of recovery (except placer) and class of material processed, in terms of gross metal content

Class of material	Quantity treated (short tons)	Gross metal content: Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORE TREATED AT MILLS						
Dry gold	77,273	31,057	191,184	300,000		
Copper	286		395	12,000	2,000	
Lead	20,211		65,432	4,950	7,617,500	84,400
Zinc	62,206		15,435		472,780	2,784,350
Zinc-copper	657,634	38,450	161,575	10,634,071		7,025,492
Zinc-lead	418,155		37,039	30,000	15,912,442	25,320,331
Total: 1950	1,235,765	69,507	471,060	10,981,021	24,004,722	35,214,573
1949	994,458	74,026	436,131	11,476,952	13,555,766	26,728,155
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold	1,195	21,150	117,425			
Copper	23,548	33,029	102,292	10,306,154	1,811	
Lead	14,201		69,590	6,920	20,505,755	24,016
Zinc	26,400	276	4,978	128,394	524,688	30,192,765
Zinc-lead	7		6		4,704	1,447
Total: 1950	65,351	54,455	294,291	10,441,468	21,036,958	30,618,228
1949	52,887	56,955	292,438	10,895,460	12,967,803	23,656,629
ORE SHIPPED DIRECTLY TO SMELTERS						
Dry gold	43,816	31,761	31,934	126		
Lead	6		7		3,310	321
Zinc-lead	8	2	179		3,188	1,567
Total: 1950	43,830	31,763	32,120	126	6,498	1,888
1949	17,740	7,109	25,826	29,284	120,913	20,733

REVIEW BY COUNTIES AND DISTRICTS

CHELAN COUNTY

Chelan Lake District.—The Howe Sound Co. operated its Holden mine and 2,000-ton mill continuously during 1950; 657,634 tons of zinc-copper ore were treated by selective flotation and 268,640 tons of current sands and slimes by cyanidation. Gross metal content of the ore treated was 38,450 ounces of gold, 161,575 ounces of silver, 10,634,071 pounds of copper, and 7,025,492 pounds of zinc.

Peshastin Creek (Blewett) District.—The Calton Mining Co. operated its Polepick mine for about 9 months. About 20 tons of gold ore were treated in the company amalgamation mill.

Wenatchee District.—The Lovitt Mining Co., Inc., operated its Gold King mine during the entire year and shipped the total output (several thousand tons) to a smelter.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in Washington in 1950, by counties and districts, in terms of recoverable metal

County and district	Mines producing		Ore (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Asotin County: Snake River	------	1	---------	1	--------	---------	----------	----------	$35
Chelan County:									
Chelan Lake, Peshastin Creek, Wenatchee [1]	3	1	699,410	64,711	137,483	9,808,000	----------	4,859,000	5,119,356
Ferry County:									
Orient	1	-------	226	--------	43	---------	200	18,400	2,679
Republic (Eureka)	3	-------	58,262	24,929	152,628	9,600	1,000	----------	1,012,783
Garfield County Snake River	------	1	---------	31	10	---------	----------	----------	1,094
Kittitas County: Swauk Creek	2	-------	283	76	32	---------	----------	----------	2,689
Okanogan County:									
Columbia River	------	2	---------	5	--------	---------	----------	----------	175
Loomis-Oroville	1	-------	200	--------	2,706	1,000	20,800	3,000	5,891
Methow	1	-------	20,900	2,345	2,349	277,800	----------	----------	141,983
Myers Creek	1	-------	4	3	--------	---------	----------	----------	105
Pend Oreille County: Metaline	2	-------	417,228	--------	20,432	15,500	14,889,000	22,064,000	5,164,819
Snohomish County: Sultan	------	1	---------	1	--------	---------	----------	----------	35
Stevens County:									
Bossburg	3	-------	20,229	--------	46,024	2,100	5,280,000	60,500	763,482
Chewelah	1	-------	7	2	106	---------	2,800	1,100	700
Deer Trail	1	-------	1	--------	73	---------	200	200	121
Kettle Falls	1	-------	150	13	53	---------	----------	----------	503
Northport	7	-------	62,695	--------	1,717	---------	474,000	2,607,800	435,852
Total Washington	27	6	1,279,595	92,117	363,656	10,114,000	20,668,000	29,614,000	12,652,302

[1] District production combined; Bureau of Mines not at liberty to publish individual production.

FERRY COUNTY

Orient District.—The Talisman Mining & Leasing Co. operated its mine and 75-ton flotation mill during part of the year and shipped 18 tons of zinc concentrate to a smelter.

Republic (Eureka) District.—The Aurum Mining Co. was disincorporated in August 1950, and its interests were acquired by Day Mines, Inc. Intermittent operations by the two companies and by lessees during 1950 yielded several hundred tons of gold ore which were shipped to a smelter.

Knob Hill Mines, Inc., operated its mine and 400-ton flotation-cyanidation mill during the entire year. About 7 percent more ore was treated in 1950 than in 1949. The Valley mine was operated by Everett and I. G. Hougland from May 1 to September 1, during which time several hundred tons of gold ore and a small lot of copper concentrate were shipped to a smelter.

KITTITAS COUNTY

Swauk Creek District.—C. B. Jordan operated the Ace of Diamonds claim during part of the year and shipped a small quantity of bullion to the United States Assay Office at Seattle. The Nelson Hill mine was operated for a short time by S. H. Compton; one small lot of crude gold ore was shipped to a smelter.

OKANOGAN COUNTY

Loomis-Oroville District.—Kaaba Silver-Lead Mines, Inc., operated its Kaaba mine and mill during 1950. A small tonnage of lead concentrate was shipped to a smelter.

Methow District.—The Alder Gold-Copper Co. operated the Alder group and 250-ton flotation concentrator during 1950 and shipped 1,899 tons of concentrate to a copper smelter.

Myers Creek District.—One small lot of gold ore was shipped to a smelter from the Gray Eagle mine which was operated for a short time during the year.

PEND OREILLE COUNTY

Metaline District.—The American Zinc, Lead & Smelting Co. operated its Grandview mine and 700-ton flotation mill during the entire year and treated 231,031 tons of zinc-lead ore, over four times the tonnage milled in 1949, when operations were curtailed by a strike.

The Pend Oreille Mines of Pend Oreille Mines & Metals Co. was operated throughout 1950. One 800-ton unit of a new 2,400-ton flotation mill, under construction during the year, was completed and put into operation on December 15. A second 800-ton unit of the new mill was scheduled for completion and operation during the third quarter of 1951. The third unit was planned for completion early in 1952. Extensive mine development was in progress during 1950 to meet the ore requirements of the new milling facilities. Ore treated in 1950 totaled 186,197 tons, slightly less than the 186,955 tons treated in 1949. The gross metal content of the ore in 1950 was 18,000 ounces of silver, 30,000 pounds of copper, 6,336,653 pounds of lead, and 9,850,731 pounds of zinc. The mill produced 3,957 tons of lead concentrate and 7,659 tons of zinc concentrate.

STEVENS COUNTY

Bossburg District.—Bonanza Lead operated its Bonanza mine throughout the year and treated, in the company 100-ton flotation mill, about 20,000 tons (14,163 tons in 1949) of lead ore. The Silver Trail & Jasper mine was operated for a short time by the Silver Trail Mining Co.; 11 tons of lead ore were shipped to a smelter. The Young America mine was operated on a small scale by lessees who shipped 3 tons of lead concentrate and 15 tons of zinc concentrate to smelters.

Chewelah District.—District production consisted of 7 tons of zinc-lead ore from the Montgomery claim.

Deer Trail District.—One small lot of zinc-lead ore was shipped to a smelter from the Deer Trail mine.

Kettle Falls District.—The Gold Reef mine and mill were operated from January 1 to November 7. During the year the amalgamation mill was converted to a batch-leaching cyanide plant; 150 tons of gold ore were treated in 1950.

Northport (Aladdin) District.—The Admiral Consolidated Mining Co. Admiral mine and 75-ton flotation mill were operated for about 6 months during the year. Approximately 15,000 tons of zinc ore, containing 125 ounces of silver, 8,500 pounds of lead, and 308,750 pounds of zinc, was treated. The total mill output of 252 tons of zinc concentrate was trucked to a smelter. The Deep Creek and Anderson property of the Goldfield Consolidated Mines Co. was operated from July 5 to December 31; 46,980 tons of zinc ore was treated in the 260-ton flotation mill. The Last Chance Consolidated Mining Co. operated the Last Chance mine and 100-ton gravity-flotation mill part of the year. One 7-ton lot of zinc-lead concentrate was shipped. The Lead Trust mine was operated for a short time, and 6 tons of lead ore was sent to a smelter. Thomas D. Farmer operated the Farmer group for 60 days and shipped about 450 tons of zinc-lead ore to a custom mill. Approximately 156 tons of selected zinc-lead ore was shipped from the dump of the Red Top mine of the Red Top Mining Co. From this ore 3 tons of lead concentrate and 10 tons of zinc concentrate were produced.

Nashburg & Thompson shipped 23 tons of crude ore from its mine to a custom mill.

Wyoming

Gold, Silver, Copper, and Lead

(MINE REPORT)

By A. J. Martin

GENERAL SUMMARY

NO GOLD or silver was mined in Wyoming in 1950. The output in 1949 was 389 fine ounces of gold worth $13,615 and 21 fine ounces of silver worth $19. No copper or lead was produced in the State from 1947 through 1950. No Wyoming output of zinc has been recorded.

The Carissa mine in the South Pass district, Fremont County, which contributed nearly all the State output of gold from 1947 through 1949, was not worked in 1950. The Duncan gold mine in the same district was unwatered and sampled. General interest in gold mining was lacking because of the high cost of labor and materials compared with the fixed price of gold.

All tonnage figures are short tons and "dry weight"; that is, they do not include moisture.

The value of the metal production reported herein has been calculated at the prices shown in table 1.

TABLE 1.—Prices of gold, silver, copper, lead, and zinc, 1946–50

Year	Gold [1] (per fine ounce)	Silver [2] (per fine ounce)	Copper [3] (per pound)	Lead [3] (per pound)	Zinc [3] (per pound)
1946	$35	$0.808	$0.162	$0.109	$0.122
1947	35	.905	.210	.144	.121
1948	35	.905+	.217	.179	.133
1949	35	.905+	.197	.158	.124
1950	35	.905+	.208	.135	.142

[1] Price under authority of Gold Reserve Act of Jan. 31, 1934.
[2] Treasury buying price for newly mined silver. Jan. 1 to June 30, 1946—$0.71111111; July 1, 1946, to Dec. 31, 1947—$0.905; 1948–50—$0.9050505.
[3] Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946–47 includes bonus payments by Office of Metals Reserve for overquota production.

Table 2 shows the annual output of gold, silver, and copper in Wyoming from 1946 to 1950 and the total production of gold, silver, copper, and lead from 1867 to 1950.

The copper, which represents about three-fourths of the total value of the four metals, was mined in the Copper Mountain district, Fremont County; Encampment district, Carbon County; Hartville district, originally in Laramie County, now in Platte County; and Laramie (Douglas Creek) district, Albany County. About 76 percent of the copper was mined in 1883 and 1899 to 1909.

The lead came from the Spring Creek district in Carbon County, the Hurricane district in Crook County, and the Douglas Creek district in Albany County; it was mined in 1932, 1934, 1935, 1942, and 1945.

Although gold was produced from many localities throughout the State, most of the output came from placer and lode mines in the Atlantic City (South Pass) district in Fremont County. Gold has been produced in Wyoming in nearly all of the 84 years from 1867 to 1950, but cumulative output was only 80,031 ounces—more than half of which was produced before 1890.

The silver was recovered as a byproduct from copper, gold, and lead ores and placer gravel.

TABLE 2.—Mine production of gold, silver, copper, and lead in Wyoming 1946–1950, and total, 1867–1950, in terms of recoverable metal [1]

Year	Ore (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Total
		Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	
1946	61	105	$3,675	26	$21	[2] 1	$324			$4,020
1947	6,059	1,486	52,010	95	86					52,096
1948	867	115	4,025	11	10					4,035
1949	[3] 1,800	389	13,615	21	19					13,634
1950										
1867–1950	(4)	80,031	1,909,413	74,819	51,912	16,326	5,684,372	14	$1,486	7,647,183

[1] Includes recoverable metal content of gravel washed (placer operations); ore milled; and ore shipped directly to smelters during the calendar year indicated.

[2] Includes less than ½ ton of recoverable copper produced in 1945 from the Bartlett (Copper King) mine in Laramie County.

[3] Ore milled; recovery was 86 ounces of gold and 3 ounces of silver in amalgamation and cyanidation bullion and 300 ounces of gold and 18 ounces of silver in 35 tons of concentrates smelted.

[4] Figure not available.

PART IV. WORLD REVIEW

Mineral Production of the World, 1949-50

By Berenice B. Mitchell, Pauline Roberts, Helen L. Hunt, and Viola May Haslacker[1]

INTRODUCTION

THE STATISTICAL tables in this chapter present, country by country, the mineral production of the world in 1949–50. The figures are on a mine basis, unless otherwise indicated, except for cement, coke, and steel, which are measured at the processing plant. The tables are essentially a retabulation, by countries, of the 53 commodity world tables appearing in the various chapters of this volume. For lack of comprehensive information, data for the following minerals are excluded: Andalusite, aplite, asphalt, boron, bromine, calcite (optical), calcium chloride (natural), carbon dioxide, clay, columbium (niobium), diatomite (kieselguhr), dumortierite, emery, garnet (abrasive), gem stones (other than diamonds), germanium, greensand, grindstones, helium, indium, iodine, kyanite, lithium, magnesium compounds (other than magnesite), meerschaum, mineral pigments, monazite, natural gas, natural gasoline, oil shale, olivine, perlite, pumice, quartz crystal, radium, sand and gravel, selenium, sillimanite, sodium salts (other than common salt), stone, strontium, sulfur (byproduct), tantalum, tellurium, thallium, topaz (industrial), tripoli, uranium, vermiculite, wollastonite, and zirconium. In addition, a few minor geographic areas for which no statistics are available, are also omitted from the tabulation; it is believed that no significant quantities of minerals are mined in any of these areas.

The statistics in these tables were derived principally from questionnaires sent, in cooperation with the United States Department of State, to the governments of each country. Supplementary sources were United States consular reports, the Imperial Institute's Statistical Summary of the Mineral Industry of the British Commonwealth and Foreign Countries, other official publications of various countries, the United Nations Statistical Yearbook, the Year Book of the American Bureau of Metal Statistics, Minerais et Metaux, business magazines, and company reports. Where official data were not available, esti-

[1] Assisted by Shirlye M. Pittle.

mates were often supplied by Bureau of Mines commodity specialists.

In the following tables, figures marked with an asterisk (*) are estimates. Figures for 1949 that differ from those given in the 1949 Mineral Production of the World chapter represent revisions based on the latest data available. Coke entries are for coke made at high temperatures (over 1,000° C.) in slot-type or beehive ovens and exclude gas house or retort coke.

NORTH AMERICA

BRITISH WEST INDIES

TABLE 1.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Salt:			Petroleum, crude: Barbados	(3)	----------
Bahamas	60,960	60,960			
Turks and Caicos Islands	61,765	(2)			

[1] The following minerals have been produced in recent years, but no current data are available: Cayman Islands, phosphate rock; Jamaica, bauxite and gypsum; Leeward Islands, barite and salt.
[2] Data not available.
[3] Less than 500 barrels.

CANADA (INCLUDING NEWFOUNDLAND)

TABLE 2.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	335,172	358,000	Magnesium metal	(5)	1,606
Antimony [2]	72	295	Manganese ore (shipments)	----------	(5)
Arsenic, white	239	245	Mica (sales)	1,583	1,634
Asbestos (sales)[3]	521,543	794,095	Molybdenum	----------	28
Barite	42,763	53,522	Nickel	116,745	111,635
Bismuth (kilograms) [4]	46,680	101,152	Peat:		
Cadmium—smelter (kilograms)	383,983	378,393	Fuel	51	62
Cement, hydraulic	2,526,858	2,646,809	Peat moss	72,800	62,268
Chromite	347	(5)	Petroleum, crude (thousand barrels)	21,305	29,146
Coal (thousand tons):			Phosphate rock	18	117
Coal	15,648	15,361	Platinum-group metals (troy ounces):		
Lignite	1,697	1,998	Platinum	153,784	121,100
Cobalt [6]	281	284	Other platinum-group metals	182,233	148,342
Coke	3,041,315	*3,100,000	Pyrites (including cupreous pyrites)	227,227	(5)
Copper:			Salt	680,137	725,655
Mine	239,003	237,603	Silver (troy ounces)	17,641,493	22,386,456
Smelter	205,098	217,853	Talc, pyrophyllite, and soapstone	24,423	24,675
Corundum [7]	----------	(5)	Tin (long tons):		
Feldspar (shipments)	33,518	29,187	Mine	276	355
Fluorspar	56,212	59,107	Smelter	276	356
Fuel briquets	459,908	(5)	Titanium concentrates: Ilmenite	490	[8] 2,585
Gold (troy ounces)	4,123,518	4,430,612	Tungsten concentrates (60 percent WO_3 basis)	191	2
Graphite	1,948	3,231	Zinc:		
Gypsum	2,854,999	3,256,398	Mine	261,506	283,571
Iron ore (thousand tons)	3,334	3,270	Smelter	186,920	185,935
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	2,146	2,260			
Steel ingots and castings	2,894	3,070			
Lead:					
Mine	144,945	154,119			
Smelter	132,608	154,551			

[1] Magnesite has been produced in recent years, but no current data are available. Mercury is produced but no output was recorded in 1949–50.
[2] Includes antimony content of antimonial lead.
[3] Exclusive of sand, gravel, and stone.
[4] Refined metal plus bismuth content of bullion exported.
[5] Data not available.
[6] Figures comprise Canadian ore processed in Canada and exported (irrespective of year when mined), plus cobalt content of oxide made at Port Colborne from copper-nickel ore. However, figures exclude the cobalt recovered at Clydach (Wales) from Canadian nickel-copper ores.
[7] Recovered from tailing dumps.
[8] Includes titanium slag containing approximately 70 percent TiO_2.

COSTA RICA

TABLE 3.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Gold (troy ounces) [2]	284	115
Salt	8,200	8,400
Silver (troy ounces) [2] [3]	720	215

[1] Manganese ore has been produced in recent years, but no current data are available.
[2] Imports into United States.
[3] Including secondary.

CUBA

TABLE 4.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Barite (exports)		(2)	Iron ore (thousand tons)	12	12
Cement, hydraulic	312,290	316,251	Manganese ore	62,503	[3] 78,903
Chromite	97,368	[3] 117,358	Petroleum, crude (thousand barrels) [5]	*206	*156
Copper—mine	17,400	20,420	Salt	59,874	59,266
Gold (troy ounces) [4]	5,692	6,915	Silver (troy ounces) [4] [6]	157,411	221,779
Gypsum	*13,880	*15,500			

[1] Lead (mine) and magnesite have been produced in recent years, but no current data are available. Nickel and tungsten are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Exports.
[4] Imports into United States.
[5] Natural naphtha and gas oil.
[6] Including secondary.

CURAÇAO

TABLE 5.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Phosphate rock	92,784	104,240
Salt	370	3,000

DOMINICAN REPUBLIC

TABLE 6.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Cement, hydraulic	53,561	70,443	Salt:		
Gold (troy ounces) [1]	993	475	Rock	2,412	2,304
Gypsum	18,157	(2)	Other	8,140	13,740

[1] Imports into United States.
[2] Data not available.

EL SALVADOR

TABLE 7.—Mineral production, 1949-50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Gold (exports) (troy ounces)	27,091	29,053	Salt	*25,000	(1)
Lead—mine	*530	*530	Silver (troy ounces)	280,309	462,973

[1] Data not available.

GREENLAND

TABLE 8.—Mineral production, 1949-50, in metric tons

Mineral [1]	1949	1950
Coal (thousand tons)	9	(2)
Cryolite (exports)	40,990	(2)

[1] Graphite has been produced in recent years, but no current data are available.
[2] Data not available.

GUATEMALA

TABLE 9.—Mineral production, 1949-50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	35,852	41,610	Lead—smelter	68	271
Chromite	300	300	Salt	11,962	11,340
Gold (troy ounces) [2]	5	397	Silver (troy ounces)	81,502	339,360

[1] Lead (mine) and native sulfur have been produced in recent years, but no current data are available. Mica is produced, but no output was recorded in 1949-50.
[2] Imports into United States.

HAITI

Production of salt in Haiti in 1949 totaled 8,000 metric tons (preliminary figure). Bauxite and gold are produced, but no output was recorded in 1949-50.

HONDURAS

TABLE 10.—Mineral production, 1949-50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	9	(2)	Lead—mine	449	352
Gold (troy ounces)	25,832	36,545	Silver (troy ounces)	3,431,614	[3] 4,049,247

[1] Salt has been produced in recent years, but no current data are available.
[2] Data not available.
[3] Exports.

MEXICO

TABLE 11.—Mineral production, 1949–50, in metric tons

Mineral[1]	1949	1950	Mineral[1]	1949	1950
Antimony[2]	5,753	5,868	Lead:		
Arsenic, white	3,576	8,987	Mine	220,763	238,078
Bismuth, in impure bars (kilograms)	249,000	263,000	Smelter	212,004	230,831
Cadmium (kilograms)[3]	820,000	689,000	Manganese ore	*53,900	*32,400
Cement, hydraulic	1,227,600	1,522,800	Mercury (flasks)	5,250	3,713
Coal (thousand tons)	1,075	*1,000	Petroleum, crude (thousand barrels)	60,910	72,443
Coke	374,827	391,955	Silver (troy ounces)	49,454,882	49,141,445
Copper:			Tin (long tons):		
Mine	57,246	61,699	Mine	358	290
Smelter	49,359	48,477	Smelter	358	290
Fluorspar (exports)	55,772	65,667	Tungsten concentrates (60 percent WO_3 basis)	65	67
Gold (troy ounces)	405,550	408,122	Zinc:		
Graphite	23,812	24,626	Mine	178,402	223,530
Iron ore (thousand tons)	363	420	Smelter	53,496	53,492
Iron and steel (thousand tons):					
Pig iron[4]	356	249			
Steel ingots and castings	345	*320			

[1] Barite, fuel briquets, gypsum, magnesite, mica, salt, and native sulfur have been produced in recent years, but no current data are available. Chromite, molybdenum, and vanadium are produced, but no output was recorded in 1949–50.
[2] Includes antimony content of antimonial lead.
[3] Cadmium content of flue dust exported for treatment elsewhere; represent in part shipments from stocks on hand.
[4] Excluding ferro-alloy production, for which data are not yet available.

NICARAGUA

TABLE 12.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Cement, hydraulic	16,462	16,512	Salt	*10,230	11,172
Gold (exports) (troy ounces)	219,139	229,206	Silver (troy ounces)[1]	191,082	133,282

[1] Including secondary.

TRINIDAD

Production of crude petroleum in Trinidad totaled 20,617,000 barrels in 1949 and 20,632,000 barrels in 1950.

UNITED STATES (INCLUDING TERRITORIES)

TABLE 13.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Aluminum	547,449	651,920
Antimony	1,484	2,265
Arsenic, white	11,607	12,041
Asbestos (sold or used by producers)	39,360	38,495
Barite	663,428	629,060
Bauxite (dried equivalent)	1,167,230	1,368,659
Beryllium concentrates (mine shipments)	314	507
Cadmium—smelter:		
Metallic cadmium (kilograms)	3,639,432	4,021,254
Cadmium compounds (Cd content, kilograms)	92,079	154,540
Cement, hydraulic	36,312,780	39,273,486
Chromite	393	367
Coal (thousand tons):		
Anthracite, Pennsylvania	38,738	40,272
Bituminous	394,420	461,501
Lignite	2,805	2,975
Cobalt (shipments)	306	299
Coke, metallurgical	57,730,603	65,968,350
Copper:		
Mine	682,880	824,938
Smelter [2]	779,842	914,917
Feldspar (sold or used by producers)	375,307	414,472
Fluorspar (shipments)	214,733	273,524
Fuel briquets:		
Briquets	2,180,834	2,512,907
Packaged fuel	114,258	123,088
Gold—refinery (troy ounces)	1,921,949	2,288,708
Graphite (amorphous and crystalline)	5,536	4,628
Gypsum	5,994,752	7,432,186
Iron ore (thousand tons)	86,301	99,619
Iron and steel (thousand tons):		
Pig iron and ferro-alloys	49,775	60,217
Steel ingots and castings [3]	70,740	87,848
Lead:		
Mine	371,860	389,974
Refinery [4]	431,695	458,171
Magnesite	260,646	389,536
Magnesium metal	10,521	14,266
Manganese ore (shipments)	114,427	121,971
Mercury (flasks)	9,930	4,535
Mica (sold or used by producers):		
Block	233	262
Scrap	29,806	62,922
Molybdenum	10,219	12,918
Nickel—refinery [5]	717	828
Peat	117,509	118,589
Petroleum, crude (thousand barrels)	1,841,940	1,971,845
Phosphate rock (sold or used by producers)	9,131,173	10,418,122
Platinum-group metals (troy ounces):		
Platinum	19,013	37,855
Other platinum-group metals	5,794	
Potassium salts (equivalent K_2O)	1,014,586	1,167,325
Pyrites, including cupreous pyrites	905,746	946,108
Salt:		
Rock salt	3,124,637	3,562,738
Other salt	11,002,165	11,523,492
Silver (troy ounces)	34,944,554	42,308,739
Sulfur, native (long tons)	4,745,014	5,192,184
Talc, pyrophyllite, and soapstone (sold by producers)	419,023	563,132
Tin (long tons):		
Mine	68	94
Smelter [6]	35,834	33,118
Titanium concentrates:		
Ilmenite	364,989	424,851
Rutile	10,875	(7)
Tungsten concentrates (60 percent WO_3 basis) (shipments)	2,508	4,403
Zinc:		
Mine	538,142	565,513
Smelter	739,154	765,176

[1] Excludes bismuth and vanadium, data for which Bureau of Mines is not at liberty to publish. Corundum is produced, but no output was recorded in 1949–50.
[2] Smelter output from domestic and foreign ores, exclusive of scrap. Production from domestic ores only was as follows: 1949, 687,580 tons; 1950, 826,760.
[3] Data from American Iron and Steel Institute. Includes only that portion of steel for castings produced by companies manufacturing steel ingots.
[4] Figures cover lead refined from domestic and foreign ores; refined lead produced from foreign base bullion not included.
[5] Byproduct of electrolytic refining of copper.
[6] Including tin content of ores used direct to make alloys.
[7] Bureau of Mines not at liberty to publish the figures.

SOUTH AMERICA

ARGENTINA

TABLE 14.—Mineral production, 1949–50, in metric tons

Mineral[1]	1949	1950	Mineral[1]	1949	1950
Antimony	----------	(2)	Silver (troy ounces)	*1,249,421	*1,150,000
Cement, hydraulic	1,452,000	1,560,000	Sulfur, native (long tons)	9,842	*10,000
Coal (thousand tons)[3]	18	*18	Tin (long tons):		
Gold (troy ounces)	*8,000	(2)	Mine	268	*300
Lead:			Smelter	235	*300
Mine	*16,000	*20,000	Zinc:		
Smelter	27,287	*35,000	Mine	10,921	12,699
Mica (exports)	273	308	Smelter	2,648	*7,530
Petroleum, crude (thousand barrels)	22,589	23,353			

[1] Arsenic, asbestos, barite, beryl, bismuth, chromite, corundum, feldspar, fluorspar, graphite, gypsum, iron ore, pig iron, magnesite, manganese ore, peat, salt, talc, tungsten, and vanadium have been produced in recent years, but no current data are available.
[2] Data not available.
[3] In addition, the following quantities (metric tons) of asphaltite were produced and used as solid fuels: 1949, 79,477; 1950, data not available.

BOLIVIA

TABLE 15.—Mineral production,[1] 1949–50, in metric tons

Mineral[2]	1949	1950	Mineral[2]	1949	1950
Antimony	10,275	(3)	Silver (troy ounces)	6,634,627	6,566,950
Asbestos	182	(3)	Sulfur, native (long tons)	4,398	(3)
Bismuth in ore and bullion (kilograms)	[4] 8,222	(3)	Tin (long tons):		
Cement, hydraulic	41,546	(3)	Mine	34,115	31,213
Cobalt	----------	(3)	Smelter	405	393
Copper—mine	5,074	4,704	Tungsten concentrates (60 percent WO_3 basis)	2,543	2,461
Fluorspar	264	(3)	Zinc—mine	17,629	19,570
Gold (troy ounces)	33,533	1,737			
Lead—mine	26,351	(3)			
Petroleum, crude (thousand barrels)	678	616			

[1] All data are exports, except that those for cement, lead, petroleum, and zinc are actual production.
[2] Manganese ore, mica, and salt have been produced in recent years, but no current data are available. Mercury is produced, but no output was recorded in 1949–50.
[3] Data not available.
[4] Excludes bismuth content of tin concentrates exported.

BRAZIL

TABLE 16.—Mineral production, 1949–50, in metric tons

Mineral[1]	1949	1950	Mineral[1]	1949	1950
Arsenic, white	959	(2)	Magnesite	43,110	(2)
Barite	6,010	(2)	Manganese ore (exports)	149,896	*162,600
Bauxite	20,246	(2)	Mica (exports)	558	(2)
Beryllium concentrates (exports)	3,078	(2)	Nickel	7	(2)
Cement, hydraulic	1,281,047	1,381,976	Petroleum, crude (thousand barrels)	109	278
Chromite (exports)	3	(2)	Phosphate rock (apatite)	4,553	(2)
Coal (thousand tons)	2,117	*1,940	Salt	800,872	(2)
Coke	271,710	286,595	Silver (troy ounces)	21,041	*12,860
Diamonds (metric carats)	*250,000	*200,000	Talc and soapstone	7,221	(2)
Fluorspar	537	(2)	Tin (long tons):		
Gold (troy ounces)	*183,500	*180,000	Mine	325	*240
Graphite (exports)	137	(2)	Smelter	157	*240
Gypsum	50,857	(2)	Titanium concentrates:		
Iron ore (thousand tons)	1,489	1,900	Ilmenite	650	(2)
Iron and steel (thousand tons):			Rutile	----------	(2)
Pig iron and ferro-alloys	512	704	Tungsten concentrates (60 percent WO_3 basis) (exports)	575	*700
Steel ingots and castings	605	764			
Lead—smelter	1,172	*4,000			

[1] Asbestos, bismuth, cobalt, corundum, feldspar, lead (mine), and pyrites have been produced in recent years, but no current data are available. Aluminum is produced, but no output was recorded in 1949–50.
[2] Data not available.

BRITISH GUIANA

TABLE 17.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Bauxite	1,785,860	1,608,831
Diamonds (metric carats)	34,790	37,462
Gold (troy ounces)	19,368	11,800

CHILE

TABLE 18.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	291	(2)	Lead—mine	2,859	(2)
Barite	1,461	(2)	Manganese ore	27,756	24,523
Cement, hydraulic	495,208	512,848	Mercury (flasks)	754	319
Coal (thousand tons)	1,882	*1,960	Molybdenum	558	[4] 800
Cobalt		(2)	Petroleum, crude (thousand barrels)		629
Copper:			Phosphate rock (apatite)	49,311	13,437
Mine	371,095	360,515	Salt:		
Smelter	350,737	345,005	Rock salt	35,079	46,709
Feldspar		(2)	Other salt	*4,450	*942
Gold (troy ounces)	179,144	206,858	Silver (troy ounces)	799,685	746,797
Gypsum	60,303	(2)	Sulfur, native (long tons)	6,924	(2)
Iron ore (thousand tons) [3]	2,597	2,976	Talc and soapstone	110	(2)
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	19	12			
Steel ingots and castings	32	65			

[1] Potassium salts have been produced in recent years, but no current data are available. Tungsten is produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Production of Tofo Mines.
[4] Estimated exports.

COLOMBIA

TABLE 19.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	474,726	579,977	Platinum, placer (troy ounces)	20,797	26,445
Coal (thousand tons) [2]	*1,015	(3)	Salt	125,920	141,019
Gold (troy ounces)	359,474	379,412	Silver (troy ounces)	106,590	115,711
Gypsum	*2,760	1,930	Sulfur, native (long tons)	793	1,461
Petroleum, crude (thousand barrels)	29,722	34,059			

[1] Barite and mica have been produced in recent years, but no current data are available.
[2] Data previously published represented only production transported by rail.
[3] Data not available.

ECUADOR

TABLE 20.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	52,250	57,607	Petroleum, crude (thousand barrels)	2,617	2,632
Copper—mine	704	526	Salt	16,833	34,902
Gold (troy ounces)	99,241	91,946	Silver (troy ounces)	276,900	275,526
Gypsum	486	*441	Sulfur, native (long tons)	16	*27
Lead—mine	380	200			

[1] Copper (smelter) is produced, but no output was recorded in 1949–50.

FRENCH GUIANA

Production of gold in French Guiana totaled 14,265 troy ounces in 1949 and 12,249 ounces (preliminary figure) in 1950.

PANAMA

TABLE 21.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Cement, hydraulic	53,600	50,971
Gold (troy ounces)	[1] 9,657	1,118
Salt	3,408	*5,650

[1] Exports.

PERU

TABLE 22.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	815	(2)	Mercury (flasks)		(2)
Arsenic, white	980	(2)	Mica		(2)
Bismuth (kilograms):			Molybdenum	2	(2)
Metal	213,137	(2)	Petroleum, crude (thousand barrels)	14,790	15,077
In lead-bismuth alloy	2,398	(2)	Salt	55,986	(2)
Cadmium (kilograms)	800	(2)	Silver (troy ounces)	10,627,717	13,053,201
Cement, hydraulic	280,500	331,297	Sulfur, native (long tons)	271	(2)
Coal (thousand tons)	170	(2)	Tin—mine (long tons)	44	*72
Copper:			Tungsten concentrates (60 percent WO_3 basis)	455	390
Mine	27,959	29,930	Vanadium	456	436
Smelter	21,119	22,868	Zinc:		
Gold (troy ounces)	137,959	128,603	Mine	72,037	73,812
Gypsum	37,419	(2)	Smelter	1,261	1,262
Lead:					
Mine	65,357	57,356			
Smelter	36,027	31,421			

[1] Barite, feldspar, and graphite have been produced in recent years, but no current data are available. Coke is produced, but no output was recorded in 1949–50.
[2] Data not available.

SURINAM

TABLE 23.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Bauxite	2,126,654	2,080,657
Gold (troy ounces)	3,794	4,546

URUGUAY

TABLE 24.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	293,377	304,512	Mica	2	1
Feldspar	811	710	Talc and soapstone	660	681

[1] Graphite and pyrites have been produced in recent years, but no current data are available. Gold is produced, but no output was recorded in 1949–50.

VENEZUELA

TABLE 25.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Asbestos	192	(1)	Iron ore (thousand tons)		190
Cement, hydraulic	285,000	501,006	Magnesite		1,400
Coal (thousand tons)	*24	(1)	Petroleum, crude (thousand barrels)	482,316	546,783
Diamonds (metric carats)	56,362	60,389	Salt	71,926	(1)
Gold (troy ounces)	61,378	34,462			
Gypsum [2]	3,042	2,050			

[1] Data not available.
[2] Production in government quarries only.

EUROPE

ALBANIA

Production of crude petroleum in Albania totaled 2,188,000 barrels in 1949 and 2,335,000 barrels in 1950 (preliminary figures). Cement, chromite, coal, and salt have been produced in recent years, but no current data are available.

AUSTRIA

TABLE 26.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	14,835	17,988	Lead:		
Antimony [2]	379	409	Mine	4,297	4,440
Barite	8,004	10,800	Smelter	9,841	10,910
Bauxite	6,526	616	Magnesite	520,500	543,817
Cement, hydraulic	1,091,012	1,280,400	Mercury (flasks)	5	(3)
Coal (thousand tons):			Mica	253	368
Bituminous	183	*180	Molybdenum	9	(3)
Lignite	3,816	4,309	Petroleum, crude (thousand barrels)	*6,100	*6,150
Coke	775,900	*1,000,000	Pyrites, including cupreous pyrites	11,624	12,489
Copper:			Salt:		
Mine	1,296	1,635	Rock salt	719	1,085
Smelter	3,761	5,133	Other salt	229,423	236,532
Feldspar	1,912	(3)	Silver (troy ounces)	12,890	18,901
Graphite	14,093	14,685	Talc and soapstone	52,144	53,625
Iron ore (thousand tons)	1,488	1,859	Zinc—mine	2,694	2,970
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	838	883			
Steel ingots and castings	835	947			

[1] Arsenic, gold, gypsum, and phosphate rock have been produced in recent years, but no current data are available.
[2] Excludes Soviet Zone, production data for which are not available.
[3] Data not available.

BELGIUM

TABLE 27.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Arsenic, white (exports) [2]	527	1,909	Iron and steel (thousand tons):		
Cadmium—smelter (kilograms)	*148,000	(3)	Pig iron and ferro-alloys	3,749	3,693
Cement, hydraulic	2,924,998	3,557,231	Steel ingots and castings	3,849	3,788
Coal (thousand tons)	27,850	27,303	Lead—smelter [4]	79,304	62,094
Coke	3,472,284	3,243,036	Phosphate rock	44,643	50,846
Fuel briquets	780,860	1,014,290	Tin—smelter (long tons)	8,996	9,512
Iron ore (thousand tons)	42	46	Zinc—smelter [4]	176,565	177,326

[1] Barite, copper (smelter), manganese ore, and pyrites have been produced in recent years, but no current data are available.
[2] Includes Luxembourg.
[3] Data not available.
[4] Includes secondary.

BULGARIA

Production of metallurgical coke in Bulgaria totaled 8,000 metric tons in 1949 and 10,000 tons in 1950 (preliminary figures). Asbestos, cement, chromite, coal, fuel briquets, gold, graphite, gypsum, iron ore, manganese ore, salt, silver, and talc have been produced in recent years, but no current data are available.

CZECHOSLOVAKIA

TABLE 28.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	(2)	*2,000	Iron and steel (thousand tons):		
Cement, hydraulic	1,738,000	(2)	Pig iron and ferro-alloys	1,875	1,883
Coal (thousand tons):			Steel ingots and castings	2,510	2,736
Bituminous	17,003	18,456	Magnesite	(2)	*173,000
Lignite	26,526	27,506	Petroleum, crude (thousand barrels)	292	*292
Coke	4,695,000	*4,876,000			
Fuel briquets, lignite	*297,000	*303,300			
Iron ore (thousand tons)	*1,400	*1,600			

[1] Arsenic, asbestos, barite, feldspar, fuel briquets (bituminous coal), gold, graphite, lead, manganese ore, mercury, pyrites, salt, silver, and zinc have been produced in recent years, but no current data are available.
[2] Data not available.

DENMARK

TABLE 29.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Cement, hydraulic	834,000	873,000	Iron and steel (thousand tons):		
Coal: Lignite (thousand tons)	1,600	*700	Pig iron and ferro-alloys	39	51
			Steel ingots and castings	76	123
			Peat	1,416,406	901,802

FAROE ISLANDS

Coal has been produced in Faroe Islands in recent years, but no current data are available.

FINLAND

TABLE 30.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos, including flour	8,395	(2)	Lead—mine	130	(2)
Cement, hydraulic	655,984	743,000	Peat: [4]		
Cobalt	(3)	(2)	Peat for litter	*18,650	(2)
Copper:			Turf for fuel	178,538	(2)
Mine	18,741	15,600	Pyrites, including cupreous pyrites	180,040	*210,000
Smelter	18,224	13,572	Silver (troy ounces)	171,150	115,939
Feldspar	10,074	8,000	Talc and soapstone	(2)	4,000
Gold (troy ounces)	14,587	9,465	Tungsten concentrates (60 percent WO_3 basis)	49	20
Iron and steel (thousand tons):			Zinc—mine	*2,500	*1,800
Pig iron and ferro-alloys	101	63			
Steel ingots and castings	114	105			

[1] Beryl, graphite, and gypsum have been produced in recent years, but no current data are available. Molybdenum and nickel are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Less than 1 ton.
[4] Data on peat completely revised in recent Finnish official statistics. For earlier years, *see* Peat chapter.

FRANCE

TABLE 31.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	54,140	*61,000	Iron and steel (thousand tons):		
Antimony	294	*330	Pig iron and ferro-alloys:		
Asbestos	1,059	(2)	France	8,355	7,844
Barite	32,833	(2)	Saar	1,582	1,682
Bauxite	757,560	804,396	Steel ingots and castings:		
Bismuth (kilograms)	*30,000	(2)	France	9,108	8,652
Cadmium—smelter (kilograms)	58,123	(2)	Saar	1,757	1,896
Cement, hydraulic	6,443,352	7,208,400	Lead:		
Coal (thousand tons):			Mine	9,936	11,000
Bituminous and anthracite:			Smelter	54,450	61,236
France	51,199	50,818	Magnesium metal	*700	300
Saar	14,262	15,092	Petroleum, crude (thousand barrels)	411	909
Lignite	1,845	1,688	Phosphate rock	67,509	73,752
Coke:			Potassium salts (equivalent K_2O)	896,000	1,017,800
France	6,769,000	7,011,745	Pyrites, including cupreous pyrites	205,909	(2)
Saar	3,327,000	3,226,989	Salt	*676,000	(2)
Feldspar	45,000	42,000	Silver (troy ounces)	570,888	549,669
Fluorspar	39,954	(2)	Talc and soapstone	99,650	95,500
Fuel briquets	6,365,000	6,307,000	Tin—mine (long tons)	73	*84
Gold (troy ounces)	47,294	63,015	Tungsten concentrates (60 percent WO_3 basis)	700	*400
Gypsum	1,062,000	2,100,000	Zinc:		
Iron ore (thousand tons) [3]	31,424	30,203	Mine	11,159	12,419
			Smelter	60,597	71,531

[1] Arsenic, beryl, copper, molybdenum, peat, salt (rock), and native sulfur have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Including Moselle (Lorraine).

GERMANY

TABLE 32.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
FEDERAL REPUBLIC [1]		
Aluminum	28,848	26,951
Barite	[2] 183,457	(3)
Cadmium—Smelter (kilograms)	[4] 5,000	(3)
Cement, hydraulic	8,460,000	10,877,000
Coal (thousand tons): [5]		
Bituminous and anthracite	104,808	110,756
Lignite	72,064	75,840
Coke	25,140,000	27,333,400
Copper: [6]		
Mine	864	1,360
Smelter [7]	145,536	200,648
Feldspar	49,544	(3)
Fluorspar	33,871	(3)
Fuel briquets: [4]		
Bituminous and anthracite	3,586,000	3,720,000
Lignite	14,250,000	14,910,000
Graphite	5,097	*6,200
Gypsum [8]	515,300	*344,000
Iron ore (thousand tons) [9]	9,112	10,882
Iron and steel (thousand tons):		
Pig iron and ferro-alloys	7,140	9,480
Steel ingots and castings	9,156	12,121
Lead:		
Mine	40,944	44,830
Smelter [7]	99,372	118,140
Magnesite	11,264	(3)
Magnesium metal	------------	(3)
Peat	[2] 1,203,266	(3)
Petroleum, crude (thousand barrels)	5,947	7,904

Mineral	1949	1950
FEDERAL REPUBLIC [1]—Continued		
Potassium salts (equivalent K_2O)	788,800	911,600
Pyrites, including cupreous pyrites	431,963	525,400
Salt	1,800,000	2,470,000
Silver (troy ounces)	1,601,782	(3)
Talc and soapstone	30,968	(3)
Tin (long tons):		
Mine	*120	*120
Smelter	*120	*120
Zinc:		
Mine	57,816	69,298
Smelter	[7] 86,916	112,791
SOVIET ZONE [10]		
Barite	(11)	(3)
Cement, hydraulic	1,000,000	(3)
Coal (thousand tons): [12]		
Bituminous and anthracite	3,000	3,000
Lignite	*117,000	*123,000
Coke	*275,000	*300,000
Fuel briquets:		
Bituminous and anthracite	------------	------------
Lignite	*30,000,000	*30,000,000
Iron ore (thousand tons) [9]	*250	*328
Iron and steel (thousand tons):		
Pig iron and ferro-alloys	250	288
Steel ingots and castings	700	1,155
Peat	(11)	(3)

[1] Arsenic, bauxite, bismuth, cobalt, gold, manganese ore, mercury, and phosphate rock have been produced in recent years, but no current data are available. Nickel is produced, but no output was recorded in 1949–50.
[2] Includes Soviet Zone.
[3] Not available.
[4] American-British zones (Bizonal area) only.
[5] Excludes production of the Saar.
[6] Approximate production.
[7] Includes secondary.
[8] Crude-production estimates based on the following calcined figures: 1949, 429,400; 1950, 286,592.
[9] Exclusive of manganiferous iron ore carrying 12 to 30 percent manganese.
[10] Aluminum, arsenic, bauxite, bismuth, cobalt, copper, fluorspar, gold, lead, magnesium, manganese ore, mercury, phosphate rock, potassium salts, pyrites, and zinc have been produced in recent years, but no current data are available. Nickel is produced, but no output was recorded in 1949–50. *See also* introduction to chapter.
[11] Included with Federal Republic.
[12] Planned production.

GREECE

TABLE 33.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Antimony	210	1,505
Arsenic, white	13	(2)
Barite	15,604	20,799
Bauxite	48,852	(2)
Cement, hydraulic	*326,000	(2)
Chromite	3,381	12,631
Coal: Lignite (thousand tons)	180	*160
Iron ore (exports) (thousand tons)	22	41
Lead:		
Mine	2,051	*2,000
Smelter	1,706	2,125
Magnesite	17,090	26,256
Manganese ore	1,150	(2)
Pyrites, including cupreous pyrites	15,785	87,678
Steel, ingots and castings (thousand tons)	*23	*26
Talc and soapstone	1,700	2,500
Zinc—mine	1,695	3,184

[1] Gypsum, molybdenum, salt, silver, and native sulfur have been produced in recent years, but no current data are available. Nickel is produced, but no output was recorded in 1949–50.
[2] Data not available.

HUNGARY

TABLE 34.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	*14,000	(2)	Iron and steel (thousand tons):		
Bauxite	*600,000	(2)	Pig iron and ferro-alloys	428	*500
Cement, hydraulic	*640,000	(2)	Steel ingots and castings	849	1,022
Coal (thousand tons):			Lead—mine	(2)	300
Bituminous	*1,380	(2)	Petroleum, crude (thousand barrels)	3,791	*4,198
Lignite	*10,450	(2)			
Iron ore (thousand tons)	339	368			

[1] Arsenic, copper (mine), fuel briquets, gold, lead (smelter), manganese ore, peat, pyrites, salt, and silver have been produced in recent years, but no current data are available. Antimony is produced, but no output was recorded in 1949-50.
[2] Data not available.

ICELAND

Peat has been produced in Iceland in recent years, but no current data are available.

IRELAND

TABLE 35.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	*453,000	(2)	Fuel briquets	16,257	(2)
Coal (thousand tons)	115	181	Peat	*4,079,400	(2)

[1] Barite, gypsum, phosphate rock, and pyrites have been produced in recent years, but no current data are available.
[2] Data not available.

ITALY

TABLE 36.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	25,647	37,070	Lead:		
Antimony	360	400	Mine	34,600	*38,000
Arsenic, white	1,440	[2] 520	Smelter	28,460	37,469
Asbestos	15,365	21,433	Magnesite	456	200
Barite	46,616	48,142	Manganese ore	24,219	16,208
Bauxite	104,852	153,433	Mercury (flasks)	44,527	53,346
Cadmium—smelter (kilograms)	73,000	[2] 42,000	Molybdenum	----------	(4)
Cement, hydraulic	4,036,501	5,003,546	Petroleum, crude (thousand barrels)	71	63
Coal (thousand tons):			Platinum—refinery (troy ounces)	----------	(4)
Bituminous and anthracite	1,104	1,030	Pyrites, including cupreous pyrites	866,179	895,459
Lignite	832	780	Salt	814,420	(4)
Cobalt	(3)	(4)	Silver (troy ounces)	793,545	851,995
Coke	1,511,171	1,501,616	Sulfur, native, crude (long tons) [5]	185,567	209,767
Copper:			Talc and soapstone	60,210	66,737
Mine	6	34	Tungsten concentrates (60 percent WO_3 basis)	1	2
Smelter	30	54	Zinc:		
Feldspar	10,901	14,254	Mine	73,800	85,348
Fluorspar	17,746	31,611	Smelter	26,612	38,119
Gold (troy ounces)	10,385	10,674			
Graphite	4,011	3,855			
Iron ore (thousand tons)	521	442			
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	445	570			
Steel ingots and castings	2,055	2,362			

[1] Fuel briquets, gypsum, mica, peat, phosphate rock, and potassium salts have been produced in recent years, but no current data are available. Magnesium metal, nickel, and tin are produced, but no output was recorded in 1949-50.
[2] January to September, inclusive.
[3] Less than 1 ton.
[4] Data not available.
[5] In addition, the following tonnages of ground sulfur rock (30 percent S) were produced and used as an insecticide: 1949, 19,213 tons; 1950, 15,778 tons.

LUXEMBOURG

TABLE 37.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	121,000	125,000	Iron and steel (thousand tons):		
Iron ore (thousand tons)	4,137	3,845	Pig iron and ferro-alloys	2,372	2,499
			Steel ingots and castings	2,272	2,449

[1] Gypsum has been produced in recent years, but no current data are available.

MALTA

Production of salt in Malta totaled 1,807 metric tons in 1949 and 1,827 tons in 1950.

NETHERLANDS

TABLE 38.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Cement, hydraulic	552,032	592,800	Iron and steel (thousand tons):		
Coal (thousand tons):			Pig iron and ferro-alloys	434	454
Bituminous	11,705	12,247	Steel ingots and castings	437	490
Lignite	205	194	Peat	779,000	520,000
Coke	2,474,400	2,803,900	Petroleum, crude (thousand barrels) [1]	4,314	4,897
Fuel briquets:			Salt	331,000	412,570
Bituminous	992,000	1,049,000	Tin—smelter (long tons)	19,247	21,027
Lignite	61,000	56,000	Zinc—smelter	15,614	19,752

[1] Data revised in accordance with recent information stating 6.948 barrels per metric ton.

NORWAY

TABLE 39.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	35,047	46,622	Magnesium metal		(2)
Cadmium—smelter (kilograms)	71,400	(2)	Mica (exports)	113	571
Cement, hydraulic	592,184	583,200	Molybdenum	71	62
Copper:			Peat	381,659	358,200
Mine	14,875	15,400	Pyrites, including cupreous pyrites	745,367	749,363
Smelter	9,306	9,338	Silver (troy ounces)	170,399	*150,000
Feldspar (exports)	21,932	20,846	Talc and soapstone	*[4] 40,900	55,000
Graphite (exports)	2,196	1,902	Titanium concentrates:		
Iron ore (thousand tons)	267	[3] 430	Ilmenite	99,013	105,000
Iron and steel (thousand tons):			Rutile	16	(2)
Pig iron and ferro-alloys	230	220	Zinc:		
Steel ingots and castings	72	70	Mine	6,610	6,900
Lead—mine	320	(2)	Smelter	41,040	44,000
Magnesite	1,100	(2)			

[1] Barite, beryl, bismuth, fluorspar, gold, and phosphate rock have been produced in recent years, but no current data are available. Coke, lead (smelter), nickel, tin (smelter), and tungsten are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Including titaniferous iron ore.
[4] Exports.

POLAND

TABLE 40.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	2,200,000	2,376,000	Iron and steel (thousand tons):		
Coal (thousand tons):			Pig iron and ferro-alloys	*1,243	*1,250
Bituminous	74,103	*77,530	Steel ingots and castings	2,305	(3)
Lignite	4,627	*4,750	Lead—smelter	17,850	(3)
Coke	5,751,000	5,924,000			
Fuel briquets:			Petroleum, crude (thousand barrels)	*1,205	*1,205
Bituminous	796,000	[2] 631,300			
Lignite	175,000	[2] 170,200	Pyrites, including cupreous pyrites	81,000	(3)
Gypsum	26,361	(3)	Salt	800,000	(3)
Iron ore (thousand tons)	699	790			

[1] Cadmium, magnesite, peat, phosphate rock, potassium salts, silver, and zinc have been produced in recent years, but no current data are available.
[2] Incomplete.
[3] Data not available.

PORTUGAL

TABLE 41.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Arsenic, white	[2] 744	801	Manganese ore	508	798
Asbestos	101	271	Mica	-------	(3)
Beryllium concentrates	*20	*49	Peat	266	402
Cement, hydraulic	521,435	572,549	Pyrites, including cupreous pyrites	622,925	613,522
Chromite	*500	(3)	Salt (exports) (other than rock)	(3)	30,765
Coal (thousand tons):			Silver (troy ounces)	31,958	(3)
Bituminous and anthracite	443	426	Tin (long tons):		
Lignite	111	95	Mine [4]	785	690
Fuel briquets	(3)	*78,300	Smelter	218	*240
Gold (troy ounces)	10,385	(3)	Titanium concentrates: Ilmenite	680	47
Gypsum	43,060	(3)			
Lead—smelter	304	591	Tungsten concentrates (60 percent WO_3 basis)	2,700	2,500

[1] Antimony, barite, feldspar, iron ore, salt (rock), and talc have been produced in recent years, but no current data are available.
[2] Exports.
[3] Data not available.
[4] Excluding content of mixed concentrates.

RUMANIA

TABLE 42.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	560,000	650,000	Iron and steel (thousand tons):		
Coal (thousand tons):			Pig iron and ferro-alloys	*200	*243
Bituminous and anthracite	187	*3,045 (Bituminous and anthracite, and lignite)	Steel ingots and castings	*459	*558
Lignite	2,576		Manganese ore	*65,000	(2)
Coke	*100,000	*120,000			
Gold (troy ounces)	112,528	(2)	Petroleum, crude (thousand barrels)	*33,700	*32,000
Iron ore (thousand tons)	*324	*395	Pyrites, including cupreous pyrites	*5,000	(2)

[1] Bauxite, beryl, bismuth, copper (smelter), feldspar, fuel bricquets, gypsum, lead, mercury, mica, molybdenum, phosphate rock, salt, silver, talc, and zinc have been produced in recent years, but no current data are available.
[2] Data not available.

SPAIN

TABLE 43.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Aluminum	1,212	2,167
Antimony	171	[2] *400
Arsenic, white	124	(3)
Asbestos	40	(3)
Barite	7,665	(3)
Bauxite	11,962	12,186
Bismuth—smelter (kilograms)	19,854	(3)
Cement, hydraulic	2,247,608	2,521,107
Coal (thousand tons):		
Bituminous and anthracite	10,641	10,183
Lignite	1,321	*1,350
Coke	967,497	946,100
Copper:		
Mine [4]	6,702	6,802
Smelter	6,155	5,400
Feldspar (quarry) [5]	396	1,650
Fluorspar	59,594	32,669
Fuel briquets	1,135,859	1,092,000
Gold (troy ounces)	30,318	13,217
Graphite	256	313
Gypsum	1,293,552	2,251,831
Iron ore (thousand tons)	1,876	2,079
Iron and steel (thousand tons):		
Pig iron and ferro-alloys	634	680
Steel ingots and castings	652	759

Mineral [1]	1949	1950
Lead:		
Mine	31,550	[2] 32,400
Smelter	33,021	34,876
Magnesite	6,691	7,632
Manganese ore	18,651	*17,000
Mercury (flasks)	32,289	*50,000
Mica	9	14
Phosphate rock	23,093	24,080
Potassium salts (equivalent K_2O)	137,700	152,000
Pyrites, including cupreous pyrites	1,132,793	1,306,859
Salt:		
Rock salt	288,896	313,676
Other salt	546,886	(3)
Silver (troy ounces)	514,283	823,059
Sulfur, native (long tons)	5,000	7,600
Talc and soapstone [6]	38,208	25,131
Tin (long tons):		
Mine	666	*575
Smelter	803	844
Titanium concentrates: Ilmenite	376	637
Tungsten concentrates (60 percent WO_3 basis)	888	815
Zinc:		
Mine	*50,000	*64,000
Smelter	19,551	21,264

[1] Beryl, cobalt, and molybdenum have been produced in recent years, but no current data are available.
[2] Including Spanish Morocco.
[3] Data not available.
[4] According to Year Book of American Bureau of Metal Statistics.
[5] There is some additional production of feldspar, but comaparable figures are not available.
[6] Includes steatite as follows: 1949: 20,880; 1950: 13,702.

SVALBARD (SPITSBERGEN)

Production of coal in Svalbard (Spitsbergen) totaled 455,000 metric tons in 1949 and 379,000 tons (preliminary figure) in 1950, all from Norwegian mines.

SWEDEN

TABLE 44.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Aluminum (includes alloys)	3,929	4,000
Cement, hydraulic	1,698,369	1,944,000
Chromite	----------	(2)
Coal (thousand tons)	317	303
Coke	82,600	72,000
Copper:		
Mine	16,273	16,099
Smelter	14,359	16,708
Feldspar	38,959	(2)
Fuel briquets	54,500	(2)
Gold (troy ounces)	80,280	(2)
Graphite	----------	(2)
Gypsum	----------	(2)
Iron ore (thousand tons)	13,748	13,927
Iron and steel (thousand tons):		
Pig iron and ferro-alloys	860	848
Steel ingots and castings	1,370	1,438

Mineral [1]	1949	1950
Lead:		
Mine	23,900	(2)
Smelter	10,757	*[3] 14,500
Manganese ore	*10,850	(2)
Mica	61	(2)
Molybdenum	9	(2)
Phosphate rock (apatite)	1,604	(2)
Pyrites, including cupreous pyrites	424,007	(2)
Silver (troy ounces)	1,140,708	1,291,656
Talc and soapstone	11,293	(2)
Tungsten concentrates (60 percent WO_3 basis)	468	362
Zinc—mine	35,158	36,714

[1] Arsenic, barite, bismuth, cobalt, fluorspar, peat, and salt have been produced in recent years, but no current data are available. Mercury, nickel, and zinc (smelter) are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Includes secondary.

SWITZERLAND

TABLE 45.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	21,000	21,000	Iron and steel (thousand tons):		
Asbestos	----------	(2)	Pig iron and ferro-alloys	*32	34
Cement, hydraulic	*950,000	1,078,000	Steel ingots and castings	100	*130
Gypsum	*80,000	*80,000	Salt	*100,000	94,000
Iron ore (thousand tons)	70	55			

[1] Barite and peat have been produced in recent years, but no current data are available. Coal, fluorspar, magnesium metal, and manganese ore are produced, but no output was recorded in 1949–50.
[2] Data not available.

TURKEY (IN EUROPE)

Data on output of Turkey in Europe are included with those of Turkey in Asia.

U. S. S. R. (IN EUROPE AND ASIA)

TABLE 46.—Mineral production, 1949–50, in metric tons (all data estimated)

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	165,000	190,000	Lead—smelter	90,000	104,000
Cement, hydraulic	8,000,000	10,500,000	Manganese ore	1,500,000	2,000,000
Chromite	350,000	500,000	Nickel	25,000	25,000
Coal (thousand tons)	236,000	264,000	Petroleum, crude (thousand barrels)	244,700	273,200
Coke	24,000,000	27,000,000	Platinum, placer (troy ounces)	100,000	100,000
Copper—smelter	200,000	218,000	Salt	(2)	(2)
Gold (troy ounces)	7,000,000	7,000,000	Tungsten concentrates (60 percent WO_3 basis)	1,500	1,500
Iron and steel (thousand tons):			Zinc—smelter	110,000	128,700
Pig iron and ferro-alloys	16,700	19,500			
Steel ingots and castings	23,000	27,000			

[1] Antimony, arsenic, asbestos, barite, bauxite, beryl, bismuth, cadmium, corundum, diamonds, feldspar, fluorspar, fuel briquets, graphite, gypsum, iron ore, lead (mine), magnesite, magnesium metal, mercury, mica, molybdenum, peat, phosphate rock, potassium salts, pyrites, silver, native sulfur, and talc have been produced in recent years, but no current data are available.
[2] Exceeds 4,000,000 tons.

UNITED KINGDOM

TABLE 47.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	30,832	29,941	Lead:		
Bauxite (Northern Ireland)	----------	(2)	Mine	2,156	3,073
Cadmium—smelter (kilograms)	102,662	118,878	Smelter	*2,156	*3,073
Cement, hydraulic	9,364,000	9,912,600	Magnesium metal [6]	5,100	4,900
Coal (thousand tons):			Petroleum, crude (thousand barrels)	338	340
Great Britain	218,570	219,791	Pyrites, including cupreous pyrites	*13,181	(2)
Northern Ireland:			Salt:		
Bituminous	(3)	(2)	Rock salt	*41,400	(2)
Lignite	(3)	(2)	Other salt	*3,740,000	(2)
Coke [4]	15,739,630	15,640,000	Northern Ireland	12,973	(2)
Feldspar (Northern Ireland)	----------	(2)	Talc and soapstone	2,616	(2)
Fluorspar	67,575	(2)	Tin (long tons):		
Fuel briquets	1,536,268	*1,406,000	Mine	1,212	960
Gypsum (Northern Ireland)	----------	(2)	Smelter [7]	28,384	27,310
Iron ore (thousand tons) [5]	13,612	13,145	Tungsten concentrates (60 percent WO_3 basis)	39	61
Iron and steel (thousand tons):			Zinc—smelter	65,124	71,418
Pig iron and ferro-alloys	9,653	9,785			
Steel ingots and castings	15,803	16,555			

[1] Arsenic, barite, bismuth, chromite, gypsum, and silver have been produced in recent years, but no current data are available. Manganese ore and zinc (mine) are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Less than 1,000 tons.
[4] In Great Britain production of gas-house coke, which is not included herein, is especially important: It averaged 11,000,000 tons per year in 1941–45 and increased 15 percent in 1946–47 and 25–30 percent in 1948–49; data for 1950 incomplete.
[5] Exclusive of bog ore, which is used mainly for purification of gas.
[6] Includes secondary.
[7] Includes production from imported scrap.

YUGOSLAVIA

TABLE 48.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	2,400	*2,500	Lead:		
Antimony	2,789	(2)	Mine	72,200	*80,000
Bauxite	*368,000	(2)	Smelter	56,800	*69,800
Cement, hydraulic	*1,300,000	(2)	Manganese ore	*14,000	(2)
Chromite	*93,000	*100,000	Petroleum, crude (thousand barrels)	470	780
Coal (thousand tons)	12,122	*13,000	Pyrites, including cupreous pyrites	73,000	(2)
Copper—smelter [3]	34,000	40,000	Salt	*108,900	(2)
Iron ore (thousand tons)	835	*800	Zinc—mine	36,559	*43,500
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	191	*210			
Steel ingots and castings	399	*420			

[1] Barite, bismuth, copper (mine), fuel briquets, gold, gypsum, magnesite, mercury, molybdenum, silver, and zinc (smelter) have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Approximate production.

ASIA

ADEN

Production of salt in Aden totaled 308,302 metric tons in 1949 and 259,972 tons in 1950.

AFGHANISTAN

Salt and talc have been produced in recent years in Afghanistan, but no current data are available. Production of coal in Afghanistan totaled 5,000 metric tons in 1949; data for 1950 are not available. Production of beryllium in Afghanistan totaled 7 metric tons in 1950.

BAHREIN ISLAND

Bahrein Island produced 10,985,000 barrels of crude petroleum in 1949 and 11,016,000 barrels in 1950.

BRITISH BORNEO

TABLE 49.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony [2]	1	2	Petroleum, crude (thousand barrels)	25,108	30,958
Gold (troy ounces) [2]	1,523	1,440	Phosphate rock (guano)	508	(3)

[1] Coal and silver have been produced in recent years, but no current data are available.
[2] Sarawak only.
[3] Data not available.

BURMA

TABLE 50.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	*70	(2)	Salt	31,692	(2)
Gold (troy ounces)	158	(2)	Tin—mine (long tons)	1,781	*1,682
Lead—smelter	[3] 2,318	-------	Tungsten concentrates (60 percent WO_3 basis)	740	*600
Petroleum, crude (thousand barrels)	248	*450			

[1] Bismuth, lead (mine), iron ore, manganese ore, and silver have been produced in recent years, but no current data are available. Cobalt is produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Exports.

CEYLON

TABLE 51.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Graphite (exports)	12,437	13,030
Gypsum	37	(2)
Salt	28,780	66,093

[1] Mica is produced, but no output was recorded in 1949–50.
[2] Data not available.

CHINA (EXCEPT FORMOSA)

TABLE 52.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum [2]		(3)	Lead—smelter	2,062	*4,000
Antimony	*6,000	(3)	Petroleum, crude (thousand barrels)	730	*730
Cement, hydraulic [2]	218,000	430,000	Salt	*2,000,000	*2,500,000
Coal, bituminous and anthracite (thousand tons)	*16,000	[4] 36,660	Silver (troy ounces)	160,000	320,000
Coke	*100,000	*300,000	Tin—smelter (long tons)	*4,200	*3,600
Copper—smelter	1,874	[5] 4,000	Tungsten concentrates (60 percent WO_3 basis)	*8,000	*11,000
Gold (troy ounces)	*60,000	*160,000			
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	*317	*1,022			
Steel ingots and castings	*100	*540			

[1] Arsenic, asbestos, barite, bismuth, coal (lignite), cobalt, feldspar, fluorspar, graphite, gypsum, iron ore, magnesite, magnesium metal, manganese ore, mercury, mica, molybdenum, phosphate rock, potassium salts, pyrites, native sulfur, talc, and zinc (smelter) have been produced in recent years, but no current data are available.
[2] Manchuria only. [3] Data not available. [4] Planned production. [5] Approximate production.

CHRISTMAS ISLAND

Exports of phosphate rock from Christmas Island totaled 255,236 metric tons in 1949; data for 1950 are not available. This Christmas Island is south of Java, not the Christmas Island south of Hawaii.

CYPRUS

TABLE 53.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	12,556	(2)	Magnesite (exports)	20	20
Chromite (exports)	14,875	(2)	Pyrites, including cupreous pyrites	942,808	[3] 655,059
Copper—mine (exports)	23,936	23,301	Salt		(2)
Gypsum (exports)	25,788	65,485			

[1] Gold and silver have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Exports.

FRENCH INDOCHINA

TABLE 54.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	154,000	144,000	Salt	113,600	*89,600
Chromite		(2)	Talc and soapstone		(2)
Coal, bituminous and anthracite (thousand tons)	385	497	Tin (long tons):		
Molybdenum		(2)	Mine	40	62
			Smelter	*60	*60

[1] Asbestos, fuel briquets, gold, manganese ore, and phosphate rock have been produced in recent years, but no current data are available. Antimony, bauxite, coal (lignite), coke, graphite, iron ore, lead (smelter), tungsten, and zinc are produced, but no output was recorded in 1949–50.
[2] Data not available.

HONG KONG

Production of hydraulic cement in Hong Kong totaled 58,700 metric tons in 1949 and 68,400 tons in 1950. Production of iron ore in Hong Kong totaled 59,000 metric tons in 1949 and 169,000 tons in 1950. Silver has been produced in recent years, but no current data are available.

INDIA

TABLE 55.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	3,547	3,650	Lead—smelter	603	600
Asbestos	148	(2)	Magnesite	92,018	(2)
Barite	21,487	(2)	Manganese ore	656,190	[3] 679,163
Bauxite	41,302	(2)	Mica (exports)	13,743	15,874
Cement, hydraulic	2,135,737	2,652,000	Petroleum, crude (thousand barrels)	1,906	*1,867
Chromite	19,728	(2)	Phosphate rock (apatite)	588	(2)
Coal (thousand tons)	31,962	32,506	Salt:		
Coke	2,038,319	*2,000,000	Rock salt	4,229	(2)
Copper:			Other salt	2,022,060	2,657,929
Mine	6,305	7,000	Silver (troy ounces)	11,275	15,676
Smelter	6,493	6,720	Talc and soapstone	21,535	(2)
Corundum	1,493	(2)	Titanium concentrates:		
Feldspar	863	(2)	Ilmenite	226,816	216,076
Gold (troy ounces)	163,871	196,848	Rutile		(2)
Graphite	988	(2)	Tungsten concentrates (60 percent WO_3 basis)		(2)
Gypsum	142,190	(2)			
Iron ore (thousand tons)	2,854	*3,000			
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	1,671	1,689			
Steel ingots and castings	1,374	1,437			

[1] Beryl, diamonds, fluorspar, and potassium salts have been produced in recent years, but no current data are available. Fuel briquets are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Exports.

INDONESIA

TABLE 56.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Bauxite	678,138	551,143	Phosphate rock	*5,000	
Coal (thousand tons)	662	*790	Salt	320,000	(2)
Fuel briquets	25,323	25,278	Tin (long tons):		
Gold (troy ounces)	*32,000	(2)	Mine	28,965	32,099
Petroleum, crude (thousand barrels) [3]	44,932	50,148	Smelter	126	32

[1] Cement, silver, and native sulfur have been produced in recent years, but no current data are available. Copper (mine), manganese ore, nickel, and platinum are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] Includes New Guinea, whose production amounted to 1,725,500 barrels in 1949 and 1,748,000 barrels in 1950.

IRAN

TABLE 57.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Cement, hydraulic [2]	58,500	64,000
Coal (thousand tons)	[2] 170	(3)
Petroleum, crude (thousand barrels)	204,712	242,475

[1] Antimony, arsenic, chromite, manganese ore, and salt have been produced in recent years, but no current data are available.
[2] Fiscal year ended March 20 of year following that stated.
[3] Data not available.

IRAQ

TABLE 58.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Cement, hydraulic [2]	7,007	66,051
Petroleum, crude (thousand barrels)	30,957	49,919
Salt	8,989	12,000

[1] Gypsum has been produced in recent years, but no current data are available.
[2] First produced in October 1949.

ISRAEL AND ARAB PALESTINE

TABLE 59.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic [2]	241,393	380,128	Potassium salts (equivalent K_2O) [4]	-------	(3)
Gypsum	(3)	23,623	Salt	6,500	(3)

[1] Barite, feldspar, phosphate rock, and native sulfur have been produced in recent years, but no current data are available.
[2] Israel only.
[3] Data not available.
[4] Extracted from waters of Dead Sea.

JAPAN

TABLE 60.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	21,222	24,764	Iron and steel (thousand tons):		
Antimony	172	161	Pig iron and ferro-alloys	1,625	2,286
Arsenic, white	2,489	1,627	Steel ingots and castings	3,111	4,848
Asbestos	5,456	4,948	Lead:		
Barite	9,322	14,239	Mine	9,106	10,853
Bismuth—smelter (kilograms)	25,946	33,049	Smelter [5]	7,596	9,984
Cadmium—smelter (kilograms)	52,484	90,348	Manganese ore	100,000	134,066
Cement, hydraulic	3,274,572	4,458,000	Mercury (flasks)	2,461	1,312
Chromite	27,003	31,953	Molybdenum	---------	13
Coal (thousand tons):			Petroleum, crude (thousand barrels)	1,353	2,048
Bituminous and anthracite	38,064	38,461	Phosphate rock	684	258
Lignite	2,088	1,263	Pyrites, including cupreous pyrites	1,535,082	1,916,181
Coke	2,580,000	1,337,754	Salt	395,676	418,144
Copper:			Silver (troy ounces)	2,887,265	3,680,617
Mine	32,741	39,322	Sulfur, native (long tons)	61,414	90,940
Smelter	74,037	84,749	Talc, pyrophyllite, and soapstone	262,433	283,566
Feldspar [2]	20,055	13,187	Tin (long tons):		
Fluorspar	960	2,425	Mine	190	326
Fuel briquets [3]	615,704	915,460	Smelter	290	390
Gold (troy ounces)	84,492	132,332	Tungsten concentrates (60 percent WO_3 basis)	20	64
Graphite	5,100	3,804	Zinc:		
Gypsum	117,123	114,505	Mine	44,314	52,032
Iron ore (thousand tons) [4]	780	910	Smelter	32,318	49,008

[1] Potassium salts have been produced in recent years, but no current data are available. Bauxite, cobalt, magnesium metal, and nickel are produced, but no output was recorded in 1949–50.
[2] In addition, the following quantities of aplite and other feldspathic rock were produced: 1949, 50,943 tons; 1950, 45,679.
[3] Briquets used by government railway only. In addition, an unknown amount is manufactured for household use; accurate data not available.
[4] Includes iron sand production as follows: 1949, 23,724 tons; 1950, 87,504 tons.
[5] Excludes secondary.

KOREA (SOUTH)

TABLE 61.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos		(2)	Graphite	40,671	(2)
Bismuth (kilograms)	173,420	(2)	Iron: Pig iron and ferro-alloys (thousand tons)		(2)
Cement, hydraulic	24,132	(2)	Lead—mine	87	(2)
Coal (thousand tons):			Mica		(2)
Bituminous and anthracite	1,066	[3] 397	Molybdenum	11	(2)
Lignite	60	[3] 15	Salt	188,812	(2)
Coke [4]	*411,514	*510,000	Silver (troy ounces)	18,932	(2)
Copper:			Talc, pyrophyllite, and soapstone	2,773	(2)
Mine	28	(2)	Tungsten concentrates (60 percent WO_3 basis)	[4] *2,448	*400
Smelter	308	(2)	Zinc, mine		(2)
Fluorspar	1,230	(2)			
Fuel briquets	168,358	(2)			
Gold (troy ounces)	3,419	(2)			

[1] Aluminum, arsenic, barite, beryl, lead (smelter), manganese ore, mercury, phosphate rock, potassium salts, pyrites, and steel have been produced in recent years, but no current data are available. Iron ore, magnesite, and magnesium metal are produced, but no output was recorded in 1949–50.
[2] Data not available.
[3] January to April, inclusive.
[4] Including North Korea.

KUWAIT

Production of crude petroleum in Kuwait totaled 90,000,000 barrels in 1949 and 125,722,000 barrels in 1950.

MALAYA

TABLE 62.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Coal (thousand tons)	393	422	Titanium concentrates: Ilmenite	20,034	25,315
Gold (troy ounces)	13,617	18,436	Tungsten concentrates (60 percent WO_3 basis)	69	27
Iron ore (thousand tons)	9	507			
Tin (long tons):					
Mine	54,910	57,537			
Smelter	62,737	68,747			

[1] Graphite and silver have been produced in recent years, but no current data are available. Bauxite and manganese ore are produced, but no output was recorded in 1949-50.

PAKISTAN

TABLE 63.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	431,000	(2)	Petroleum, crude (thousand barrels)	824	800
Chromite	15,925	*18,000	Salt:		
Coal (thousand tons)	337	*430	Rock salt	175,162	(2)
Fuel briquets	8,972	*5,500	Other salt	205,318	(2)
Gypsum	15,645	*19,000			

[1] Antimony and native sulfur have been produced in recent years, but no current data are available.
[2] Data not available.

PHILIPPINES

TABLE 64.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Cement, hydraulic	201,089	292,051	Iron ore (thousand tons)	370	599
Chromite	246,744	250,511	Manganese ore	26,288	29,867
Coal (thousand tons)	123	159	Phosphate rock (guano)	10,998	32,606
Copper—mine	7,007	3,000	Salt	20,000	56,283
Gold (troy ounces)	287,844	333,991	Silver (troy ounces)	218,419	216,034
Gypsum	2,710	2,883			

[1] Pig iron has been produced in recent years, but no current data are available.

PORTUGUESE INDIA

TABLE 65.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Iron ore (thousand tons)	151	131
Manganese ore	11,197	20,144
Salt	18,132	17,608

QATAR

Production of crude petroleum in Qatar totaled 750,000 barrels in 1949 and 12,268,000 barrels in 1950.

SAUDI ARABIA

TABLE 66.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Gold (troy ounces)	66,835	66,202
Petroleum, crude (thousand barrels)	174,008	199,547
Silver (troy ounces)	81,295	124,287

SYRIA AND LEBANON

TABLE 67.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Cement, hydraulic	290,800	330,997	Gypsum [2]	1,400	2,000
Coal: Lignite (thousand tons)		(1)	Salt [2] [3]	*26,000	*20,240

[1] Data not available.
[2] Syria only.
[3] Salt has also been produced in Lebanon in recent years, but no current data are available.

TAIWAN (FORMOSA)

TABLE 68.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Aluminum	*1,580	(2)	Petroleum, crude (thousand barrels)	22	23
Cement, hydraulic	*280,800	*332,000	Salt	250,000	*160,600
Coal (thousand tons)	1,649	1,402	Silver (troy ounces)	4,836	2,098
Coke	35,971	*50,000	Sulfur, native (long tons)	344	72
Gold (troy ounces)	16,607	18,232			

[1] Copper (mine), magnesium metal, and phosphate rock have been produced in recent years, but no current data are available.
[2] Data not available.

THAILAND

TABLE 69.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	232	*100	Tin (long tons):		
Cement, hydraulic	127,200	165,600	Mine	7,817	10,364
Gypsum	154	(2)	Smelter	----------	2
			Tungsten concentrates (60 percent WO_3 basis)	742	855

[1] Gold and salt have been produced in recent years, but no current data are available.
[2] Data not available.

TURKEY (IN ASIA AND EUROPE)

TABLE 70.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	450	1,600	Iron and steel (thousand tons):		
Asbestos	170	(2)	Pig iron and ferro-alloys	113	116
Cement, hydraulic	372,584	386,813	Steel ingots and castings	103	90
Chromite	434,117	350,000	Lead—mine	168	260
Coal (thousand tons):			Magnesite	6,370	450
Bituminous	2,705	2,824	Manganese ore	25.002	*20,000
Lignite	939	*907	Mercury (flasks)	----------	(2)
Coke	293,312	308,000	Petroleum, crude (thousand barrels)	95	54
Copper:			Pyrites, including cupreous pyrites	----------	(2)
Mine	13,130	13,300	Salt	316,344	305,000
Smelter	11,283	11,700	Sulfur, native (long tons) [3]	3,046	5,708
Fuel briquets	40,102	(2)			
Iron ore (thousand tons)	211	234			

[1] Arsenic, silver, and zinc (mine) have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Refined.

U. S. S. R. (IN ASIA)

Data on output of U. S. S. R. in Asia are included with those of U. S. S. R. in Europe.

AFRICA

ALGERIA

TABLE 71.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	1,338	1,450	Mercury (flasks)	102	----------
Barite	16,874	19,890	Petroleum, crude (thousand barrels)	2	24
Cement, hydraulic	128,075	322,071	Phosphate rock	645,906	684,657
Coal (thousand tons)	265	258	Pyrites, including cupreous pyrites	32,705	25,075
Copper—mine	----------	81	Salt	101,676	(2)
Fuel briquets	56,616	(2)	Zinc—mine	6,501	7,136
Gypsum	31,881	46,097			
Iron ore (thousand tons)	2,538	2,573			
Lead—mine	1,222	1,408			

[1] Asbestos, coal (lignite), and silver have been produced in recent years, but no current data are available.
[2] Data not available.

ANGLO-EGYPTIAN SUDAN

TABLE 72.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Gold (troy ounces)	4,114	3,503
Gypsum	1,496	(2)
Salt	*43,700	(2)

[1] Magnesite has been produced in recent years, but no current data are available.
[2] Data not available.

ANGOLA

TABLE 73.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Copper—mine	800	1,375	Manganese ore	18,600	9,308
Diamonds (metric carats)	769,981	538,867	Mica	57	24
Gold (troy ounces)	319	201	Salt	41,286	40,473

[1] Gypsum has been produced in recent years, but no current data are available.

BECHUANALAND

TABLE 74.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Gold (troy ounces)	256	261
Silver (troy ounces)	23	24

BELGIAN CONGO

TABLE 75.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Bismuth (kilograms)	540	668	Manganese ore	12,247	16,990
Cadmium—smelter (kilograms)	24,635	[2] 36,000	Palladium, refinery (troy ounces)	106	----------
Cement, hydraulic	*156,914	*186,519	Salt	*1,000	(3)
Coal (thousand tons)	152	(3)	Silver (troy ounces)	4,549,330	4,459,951
Cobalt	4,350	5,249	Tin (long tons):		
Copper—smelter	141,399	175,920	Mine	13,760	13,700
Corundum	----------	(3)	Smelter	3,247	3,238
Diamonds (metric carats)	9,649,896	10,147,471	Tungsten concentrates (60 percent WO_3 basis)	276	164
Gold (troy ounces)[4]	333,853	339,415	Zinc—mine	55,420	76,312
Gypsum	----------	7,190			
Lead—mine	180	----------			

[1] Copper (mine), iron ore, and pig iron have been produced in recent years, but no current data are available.
[2] Exports.
[3] Data not available.
[4] Includes Ruanda-Urundi.

BRITISH SOMALILAND

Salt and beryllium concentrates have been produced in British Somaliland in recent years, but no current data are available.

CANARY ISLANDS

Salt has been produced in the Canary Islands in recent years, but no current data are available.

CAPE VERDE ISLANDS

Salt has been produced in the Cape Verde Islands in recent years, but no current data are available.

EGYPT

TABLE 76.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	117	260	Petroleum, crude (thousand barrels)	15,997	16,373
Barite	30	(2)	Phosphate rock	350,480	397,207
Cement, hydraulic	*800,000	*1,000,000	Salt	349,878	567,448
Chromite	50	(2)	Talc and soapstone	5,573	3,731
Gold (troy ounces)	7,045	9,242	Titanium concentrates: Ilmenite	635	260
Manganese ore	138,568	152,169			

[1] Gypsum, iron ore, pyrites, and native sulfur have been produced in recent years, but no current data are available. Feldspar, graphite, magnesite, and tungsten are produced, but no output was recorded in 1949–50.
[2] Data not available.

ERITREA

TABLE 77.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Feldspar	200	(3)	Mica	(3)	(2)
Gold (troy ounces)	2,243	1,042	Salt	85,760	(2)

[1] Cement, coal, iron ore, manganese ore, and potassium salts have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Less than 1 ton.

ETHIOPIA

TABLE 78.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Cement, hydraulic	*8,000	(2)
Gold (troy ounces)	45,102	*43,200
Platinum—placer (troy ounces)	[3] 355	(2)

[1] Gypsum, mica, potassium salts, and salt have been produced in recent years, but no current data are available.
[2] Data not available.
[3] Exports for year ended September 10 of year stated.

FRENCH CAMEROON

TABLE 79.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Gold (troy ounces)	8,938	7,170
Tin—mine (long tons)	73	67
Titanium concentrates: Rutile	403	25

FRENCH EQUATORIAL AFRICA

TABLE 80.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Diamonds (metric carats)	122,928	111,460	Titanium concentrates: Rutile		6
Gold (troy ounces)	57,260	54,996	Zinc—mine	44	621
Lead—mine	731	1,814			

[1] Graphite and salt have been produced in recent years, but no current data are available. Corundum is produced, but no output was recorded in 1949–50.

FRENCH MOROCCO

TABLE 81.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	660	670	Lead—mine	36,720	47,429
Asbestos	402	511	Manganese ore	233,830	287,265
Barite		4,910	Mica	54	82
Beryllium concentrates	211	56	Petroleum, crude (thousand barrels)	136	305
Cement, hydraulic	264,000	321,000	Phosphate rock	3,693,000	3,872,250
Coal (thousand tons)	341	368	Pyrites, including cupreous pyrites	202	1,470
Cobalt	209	390	Salt, rock	34,100	60,000
Copper—mine	360	18	Silver (troy ounces)	491,906	482,261
Fluorspar	445	40	Tungsten concentrates (60 percent WO_3 basis		7
Fuel briquets	*15,000	34,573	Zinc—mine	2,845	12,521
Gold (troy ounces)	643	119			
Graphite	72	75			
Iron ore (thousand tons)	357	319			

[1] Gypsum and salt (other than rock) have been produced in recent years, but no current data are available. Molybdenum, nickel, and tin (mine) are produced, but no output was recorded in 1949–50.

FRENCH SOMALILAND

Production of salt in French Somaliland totaled 60,000 metric tons in 1949 and 55,000 tons in 1950.

FRENCH WEST AFRICA

TABLE 82.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Bauxite	10,400	10,125	Salt	50,000	66,000
Diamonds (metric carats)	94,996	126,346	Titanium concentrates: Ilmenite [2]	8,338	788
Gold (troy ounces)	46,381	96,452			
Phosphate rock (aluminum phosphate)	5,675	11,035			

[1] Iron ore has been produced in recent years, but no current data are available.
[2] From Senegal.

GOLD COAST

TABLE 83.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Bauxite (exports)	147,340	116,793	Manganese ore (exports) [3]	752,963	711,416
Diamonds (metric carats)	[2] 972,976	*950,000	Silver (exports) (troy ounces)	38,887	43,317
Gold (exports) (troy ounces)	676,934	*680,000			

[1] Salt has been produced in recent years, but no current data are available.
[2] Exports.
[3] Dry weight.

ITALIAN SOMALILAND

The production of salt in Italian Somaliland totaled 3,000 metric tons in 1949 and 1,500 tons in 1950.

KENYA

TABLE 84.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	716	(2)	Magnesite	10	181
Feldspar	20	(2)	Mica	4	6
Gold (troy ounces)	20,072	22,945	Salt	18,820	18,722
Graphite	----------	(2)	Silver (troy ounces)	2,279	2,586
Gypsum	181	610	Talc and soapstone	590	334

[1] Beryl and pyrites have been produced in recent years, but no current data are available.
[2] Data not available.

LIBERIA

Production of gold in Liberia totaled 14,656 troy ounces in 1949 and 11,025 ounces in 1950.

LIBYA

Production of salt in Tripolitania was estimated to be 6,000 metric tons in 1949 and 9,000 tons in 1950. In Cyrenaica it totaled 500 tons in 1949, but no data for 1950 are available.

MADAGASCAR

TABLE 85.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	2	(2)	Gold (troy ounces)	1,663	1,935
Beryllium concentrates	27	486	Graphite (exports)	9,767	12,757
Coal (thousand tons)	16	(2)	Mica	959	802

[1] Beryl, cement, corundum, feldspar, iron ore, phosphate rock, salt, and talc have been produced in recent years, but no current data are available.
[2] Data not available.

MAURITIUS

Salt has been produced in Mauritius in recent years, but no current data are available.

MOZAMBIQUE

TABLE 86.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Bauxite	1,369	(2)	Graphite	110	(2)
Beryllium concentrates	136	260	Mica	103	40
Cement, hydraulic	45,841	(2)	Salt	11,004	(2)
Coal (thousand tons)	13	(2)	Silver (troy ounces)	244	(2)
Gold (troy ounces)	2,468	(2)			

[1] Corundum has been produced in recent years, but no current data are available. Tin (mine) is produced, but no output was recorded in 1949–50.
[2] Data not available.

NIGERIA

TABLE 87.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Coal (thousand tons)	559	*570	Tin—mine (long tons)	8,824	8,258
Gold (troy ounces)	2,515	2,238	Tungsten concentrates (60 percent WO_3 basis)	5	5
Lead—mine	(2)	(2)	Zinc—mine	72	----------
Silver (troy ounces)	484	325			

[1] Salt has been produced in recent years, but no current data are available.
[2] Less than 1 ton.

NORTHERN RHODESIA

TABLE 88.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Beryllium concentrates	----------	5	Lead:		
Cobalt [2]	402	670	Mine	14,169	13,905
Copper:			Smelter	14,169	13,905
Mine	259,084	297,487	Mica	3	2
Smelter	263,491	279,987	Silver (troy ounces) [5]	134,920	173,304
Gold (troy ounces) [3]	1,186	1,432	Tin—mine (long tons)	7	4
Iron ore (thousand tons)	2	(4)	Vanadium	153	----------
			Zinc—smelter	23,217	23,080

[1] Manganese ore has been produced in recent years, but it is too low-grade to be classified as such.
[2] Fiscal year ended June 30 of year stated.
[3] Included is yield from Nkana mine refinery slimes accumulated during the war: 972 tons in 1949 and 1,296 in 1950.
[4] Data not available.
[5] Recovered from an accumulation of refinery slimes.

NYASALAND

Nyasaland may have produced graphite in 1949–50, but no data are available. Nyasaland produced 113 metric tons of corundum in 1949, but no data for 1950 are available.

SEYCHELLES ISLANDS

Exports of phosphate rock (guano) from the Seychelles Islands totaled 14,171 metric tons in 1949 and 10,005 tons in 1950.

SIERRA LEONE

TABLE 89.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Chromite	22,101	(2)	Iron ore (thousand tons)	975	1,185
Diamonds (metric carats)	494,119	655,474	Platinum—placer (troy ounces)	38	(2)
Gold (troy ounces)	2,160	3,523			

[1] Silver has been produced in recent years, but no current data are available.
[2] Data not available.

SOUTHERN RHODESIA

TABLE 90.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	41	21	Lead—mine	83	--------
Arsenic, white	148	114	Magnesite	7,640	8,615
Asbestos	72,246	64,888	Manganese ore	166	--------
Barite	488	261	Mica	303	407
Beryllium concentrates	23	823	Phosphate rock	67	36
Chromite	243,506	291,525	Pyrites, including cupreous pyrites	16,968	13,810
Coal (thousand tons)	1,918	2,128	Silver (troy ounces)	84,495	85,549
Coke	81,251	*80,000	Tin (long tons):		
Copper—mine	80	117	Mine	70	65
Feldspar	--------	3,520	Smelter	75	80
Fluorspar	239	447	Tungsten concentrates (60 percent WO_3 basis)	26	64
Gold (troy ounces)	528,180	511,163			
Iron ore (thousand tons)	51	57			
Iron: Pig iron and ferro-alloys (thousand tons)	38	38			

[1] Cement and salt have been produced in recent years, but no current data are available. Corundum, graphite, and mercury are produced, but no output was recorded in 1949–50.

SOUTH-WEST AFRICA

TABLE 91.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Barite	48	--------	Salt:		
Beryllium concentrates	239	659	Rock salt	2,468	3,471
Cadmium (kilograms) [2]	755,000	787,000	Other salt	13,730	14,303
Copper—mine	9,622	10,961	Silver (troy ounces)	642,500	843,737
Diamonds (metric carats)	280,134	488,422	Tin—mine (long tons)	123	100
Gold (troy ounces)	32	32	Tungsten concentrates (60 percent WO_3 basis)	6	4
Graphite	2,264	1,380	Vanadium	165	295
Lead—mine	38,300	34,009	Zinc—mine [3]	12,700	11,500
Phosphate rock (guano)	957	581			

[1] Iron ore has been produced in recent years, but no current data are available. Lead (smelter) is produced, but no output was recorded in 1949–50.
[2] Cadmium content of ore and flue dust exported for treatment elsewhere.
[3] Zinc content of lead-copper ore sorted from dumps plus jig concentrates derived from same source.

SPANISH MOROCCO

TABLE 92.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950	Mineral	1949	1950
Antimony	144	(1)	Lead—mine	159	(1)
Graphite	15	(2)	Manganese ore	653	*750
Iron ore (thousand tons)	944	860	Salt	*10	(2)

[1] Included in Spain.
[2] Data not available.

SWAZILAND

TABLE 93.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Asbestos	30,814	29,635	Silver (troy ounces)	120	60
Barite	104	441	Tin—mine (long tons)	32	37
Gold (troy ounces)	2,841	1,794			

[1] Corundum is produced, but no output was recorded in 1949–50.

TANGANYIKA

TABLE 94.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Beryllium concentrates (exports)	1	--------	Salt	*15,200	14,152
Diamonds (metric carats)	191,787	195,274	Silver (exports) (troy ounces)	27,631	31,014
Gold (exports) (troy ounces)	68,989	65,127	Tin—mine (exports) (long tons)	113	121
Magnesite (exports)	--------	83	Tungsten concentrates (exports) (60 percent WO_3 basis)	42	15
Mica (exports)	99	136			
Phosphate rock	157	468			

[1] Corundum has been produced in recent years, but no current data are available.

TUNISIA

TABLE 95.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Barite	630	25	Manganese ore	----------	(2)
Cement, hydraulic	167,631	169,200	Phosphate rock	1,441,918	1,524,800
Coal: Lignite (thousand tons)	47	41	Pyrites, including cupreous pyrites	2,920	1,150
Fluorspar	352	----------	Salt	98,085	(2)
Fuel briquets	43,153	(2)	Silver (troy ounces)	156,638	(2)
Gypsum	22,066	(2)	Zinc—mine	3,315	2,932
Iron ore (thousand tons)	712	758			
Lead:					
Mine	14,860	19,000			
Smelter	19,498	23,536			

[1] Mercury is produced, but no output was recorded in 1949–50.
[2] Data not available.

UGANDA

TABLE 96.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Beryllium concentrates	33	44	Salt	(2)	7,413
Gold (exports) (troy ounces)	650	590	Tin—mine (exports) (long tons)	128	198
Mica	2	(2)	Tungsten concentrates (60 percent WO_3 basis)	183	217
Phosphate rock	--------	467			

[1] Asbestos, bismuth, and silver have been produced in recent years, but no current data are available.
[2] Data not available.

UNION OF SOUTH AFRICA

TABLE 97.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	4,461	8,300	Lead—mine	166	457
Asbestos	64,334	79,298	Magnesite	10,487	11,782
Barite	2,222	2,268	Manganese ore	655,175	790,937
Beryllium concentrates	223	844	Mica	1,066	1,371
Bismuth (kilograms)	5,045	7,649	Nickel	567	843
Cement, hydraulic	1,363,200	1,846,800	Phosphate rock	56,471	51,844
Chromite	404,351	496,324	Platinum-group metals (troy ounces):		
Coal (thousand tons)	25,496	26,473	Platinum-group metals from platinum ores	87,300	144,217
Coke	*360,000	*400,000	Osmiridium from gold ores	6,031	6,449
Copper:			Pyrites, including cupreous pyrites	35,527	36,026
Mine	30,454	33,982	Salt	(3)	116,236
Smelter	29,717	33,342	Silver (troy ounces)	1,159,375	1,119,135
Corundum	2,464	3,201	Talc, pyrophyllite, and soapstone	5,386	3,978
Diamonds (metric carats):			Tin (long tons):		
Lode	964,266	1,516,194	Mine	471	720
Alluvial [2]	289,756	231,674	Smelter	595	717
Feldspar (sales)	3,259	5,147	Tungsten concentrates (60 percent WO_3 basis)	416	96
Fluorspar	4,857	*7,200			
Gold (troy ounces)	11,705,048	11,663,713			
Graphite	107	244			
Gypsum (sales)	88,232	103,707			
Iron ore (thousand tons)	1,242	1,189			
Iron and steel (thousand tons):					
Pig iron and ferro-alloys	708	733			
Steel ingots and castings	632	755			

[1] Arsenic and mercury are produced, but no output was recorded in 1949–50.
[2] Includes an estimated 100,000 carats in each year for State Mines of Namagualand.
[3] Data not available.

AUSTRALIA AND OCEANIA

AUSTRALIA

TABLE 98.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950
Antimony	177	222
Arsenic, white	257	(2)
Asbestos	1,619	[3] 783
Barite	5,552	*6,000
Bauxite	5,377	3,138
Beryllium concentrates	36	[3] 23
Bismuth (kilograms) [4]	111	68
Cadmium—smelter (kilograms) (Tasmania)	271,133	287,603
Cement, hydraulic [5]	1,047,600	1,177,200
Coal (thousand tons):		
Bituminous	14,324	16,786
Lignite	7,494	7,416
Cobalt	9	10
Coke	*1,800,000	*1,800,000
Copper:		
Mine	13,678	14,500
Smelter	10,016	13,770
Corundum	----------	(2)
Feldspar [6]	10,902	[7] 8,759
Fluorspar	571	(2)
Gold (troy ounces)	889,057	850,000
Graphite	126	[7] 62
Gypsum	291,854	[8] 204,581
Iron ore (thousand tons)	1,484	2,403
Iron and steel (thousand tons): [5]		
Pig iron and ferro-alloys	1,062	1,101
Steel ingots and castings	1,183	1,400
Lead:		
Mine	216,918	222,419
Smelter	154,189	164,165
Magnesite	34,129	[7,8] 1,858
Manganese ore	13,299	[7] 14,689
Mica	736	*450
Molybdenum	4	3
Petroleum, crude (thousand barrels) (Victoria)	1	2
Phosphate rock	11	(2)
Platinum-group metals:		
Osmiridium (troy ounces)	39	46
Potassium salts (equivalent K_2O):		
Alunite	33	(2)
Alunitic mud	1,471	(2)
Pyrites, including cupreous pyrites	87,923	113,973
Salt	248,932	(2)
Silver (troy ounces)	9,849,213	10,677,456
Talc and soapstone	8,717	*7,000
Tin (long tons):		
Mine	1,973	2,472
Smelter	1,955	2,013
Titanium concentrates: [9]		
Ilmenite	10,094	*12,485
Rutile	12,615	18,606
Tungsten concentrates (60 percent WO_3 basis)	1,369	1,223
Zinc:		
Mine	184,919	196,360
Smelter	82,255	85,146

1 Chromite, diamonds, fuel briquets, and peat have been produced in recent years, but no current data are available. Magnesium metal and mercury are produced, but no output was recorded in 1949–50.
2 Data not available.
3 Incomplete data.
4 Partly estimated; excludes content of some bismuth-tungsten concentrates.
5 Fiscal year ended June 30 of year stated.
6 Includes some china stone.
7 Excluding South Australia.
8 Excluding New South Wales.
9 Excludes content of beach sand in stock dumps.

FIJI ISLANDS

TABLE 99.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Gold (troy ounces)	104,036	103,421
Manganese ore	102	203
Silver (troy ounces)	29,755	37,736

FRENCH OCEANIA

Exports of phosphate rock from French Oceania (Makatea Island, Tuamotu Archipelago) totaled 239,532 metric tons in 1949 and 245,804 tons in 1950.

NAURU AND OCEAN ISLANDS

Exports of phosphate rock from Nauru Island were 802,070 metric tons in 1949 and 1,070,358 tons in 1950. Exports of phosphate rock from Ocean Island were 265,087 metric tons in 1949 and 251,218 tons in 1950.

NEW CALEDONIA

TABLE 100.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Chromite	88,792	(2)	Iron ore (thousand tons)		15
Coke	*80,000	*80,000	Manganese ore	2,100	1,842
Gypsum	17,119	15,200	Nickel	3,371	6,300

[1] Phosphate rock has been produced in recent years, but no current data are available.
[2] Data not available.

NEW GUINEA TERRITORY [2]

TABLE 101.—Mineral production, 1949–50, in metric tons

Mineral	1949	1950
Gold (troy ounces)	93,045	*75,000
Silver (troy ounces)	[1] 31,786	(2)

[1] Fiscal year ended May 31 of year following that stated.
[2] Data not available.

NEW ZEALAND

TABLE 102.—Mineral production, 1949–50, in metric tons

Mineral [1]	1949	1950	Mineral [1]	1949	1950
Antimony	3	(2)	Magnesite	568	(2)
Arsenic, white	19	(2)	Manganese ore	310	(2)
Asbestos		(2)	Mica		(2)
Cement, hydraulic	254,039	255,528	Petroleum, crude (thousand barrels)	7	7
Coal (thousand tons):			Phosphate rock		(2)
Bituminous and anthracite	952	970	Silver (troy ounces)	232,599	199,701
Lignite	1,907	1,822	Talc and soapstone		(2)
Coke	5,080	5,894	Tungsten concentrates (60 percent WO_3 basis)	28	24
Fuel briquets	13,935	(2)			
Gold (troy ounces)	84,874	76,527			
Iron ore (thousand tons)	4				

[1] Pig iron has been produced in recent years, but no current data are available. Mercury and platinum are produced, but no output was recorded in 1949–50.
[2] Data not available.

PALAU ISLANDS

Exports of phosphate rock from Angaur Island were 157,049 metric tons in 1949 and 119,000 tons (estimate) in 1950. The destination was Japan. Peak exports of bauxite from Babelthuap Island were 135,669 metric tons in the year ended March 31, 1943, but there was no output in 1946–50.

PAPUA

Papua may have produced gold and platinum in 1949–50, but no data are available. The production of manganese ore in Papua totaled 69 metric tons in the year ended June 30, 1949; no data for 1950 are available.

[2] Does not include western New Guinea, which is part of Indonesia, or southwestern New Guinea, which is the same as Papua.

Index

By Mabel E. Winslow

S

V

W

X

Y

Z

MINERALS YEARBOOK 1950

Bureau of Mines

United States Department of the Interior

NOTICE TO READERS OF CHAPTER PREPRINTS

The following errors in Minerals Yearbook 1950 chapters have come to the attention of the Bureau of Mines since publication of the respective preprints. Some of these are in the nature of inconsistencies between various chapters arising from the availability of later or amended figures during the course of publication. Users of the preprints are advised to note the indicated corrections in their copies. All of the corrections have been incorporated into the bound volume of Minerals Yearbook 1950.

Preprint	Page	Location or item	Reads—	Should read—
Review of the Mineral Industries in 1950.	6	Zinc—primary	588	[12] 588
Employment and Injuries in the Mineral Industries.	1	First sentence	slightly over 1.5	approximately 1.6
Do	1	Third sentence	virtually equal to that	the same as
Do	6	Second paragraph, third sentence.	over 10	about 12
Do	9	Lead-Zinc Mines, third sentence.	or 5 percent	or 6 percent
Do	9	Gold-Silver Lode Mines, last sentence.	2,041 hours, or 32 less	2,038 hours, or 32 more
Do	13	Metallurgical plants, first paragraph, last sentence.	3 percent	4 percent
Arsenic	2	Table 2, Crude, shipments, short tons, 1950.	15,777	15,778
Bismuth	3	Table 3, Argentina, in ore, 1945.	3,000	31,000
Carbon Black	5	Table 5, seventh line of stub.	per thousand gallons	per gallon
Coal—Bituminous and Lignite.	7	Value of production, total, 1948.	2,993,153,747	2,993,267,021 (revised figure)
Copper	34	Table 35, title	in short tons	in metric tons
Gypsum	11	Table 10:		
		France, 1949	([2])	1,062,000
		Total, 1949	17,700,000	16,700,000
Magnesium	1	Fifth sentence	increased 23 percent * * * totaled 7,307	increased 30 percent * * * totaled 7,740
Do	1	Table 1, secondary magnesium, 1950.	7,307	7,740
Do	3	Secondary:		
		First sentence	totaled 7,307	totaled 7,740
		Second sentence	7,135 tons * * * from 7,886.	7,568 tons * * * from 8,367.
		Third sentence	about 65	about 62
		Fourth sentence	recovery, 3,249	recovery, 3,682
Secondary Metals—Nonferrous.	20	Secondary magnesium, first sentence.	7,307 short tons valued at $3,219,464.	7,740 short tons valued at $3,410,244
Do	21	17th line	49 percent	48 percent
Titanium	13	World review, second sentence.	877,000 metric * * * 20 percent.	788,000 metric * * * 8 percent.
Do	13	Table 7, Ilmenite:		
		Canada, 1950	91,172	[1] 2,585
		Total, 1950	[2] 877,000	[2] 788,000
South Dakota and Wyoming.	3	Table 5, material treated, total, 1950.	1,391,163	1,391,162
Washington	8	Table 10, boxhead	Ore and old tailings	Ore
Mineral Production of the World, 1949–50.	5	Table 11, stub	Bismuth, in pure bars	Bismuth, in impure bars

[2] Includes titanium slag containing approximately 70 percent TiO_2.

241255°—53